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The Anthropology of the Brain

3. Homo erectus, the Origin of the Races, and the Evolution of the Brain

By DONALD A. SWAN

I

In 1891 a young Dutch anatomist, Eugene Dubois, found an ancient human skullcap in a layer of gravels beside the Solo River in Java. A year later a femur or thigh bone was found in the same geological formation.[1] The cranium was small and flat, with heavy brow ridges and robust jaws. G. H. R. von Koenigswald's reconstruction of the fossil skull is presented in Figure 1. The cranial capacity was estimated at about 900 c.c. The age of the two fossils is currently dated at more than 700,000 years before the present.[2]

The shape of the femur indicated an erect posture for this early hominid. Dubois thus gave his discovery the specific name *Pithecanthropus erectus*, on the assumption that he walked upright.[3] The Trinil faunal beds in which *Pithecanthropus erectus* was found also contain "the earliest tools known in Java." Coon (1962) describes them as "crude but clearly worked flakes."[4] At the time of its discovery. *Pithecanthropus erectus* was the oldest known hominid fossil. For many years it figured in the anthropological literature as the "missing link" between man and apes.[5]

In 1907 a fossil jaw was discovered by two workmen near the base of a gravel pit in the village of Mauer, a few miles away from Heidelberg, Germany. The fossil was designated *Homo heidelbergensis* or Heidelberg Man. The jaw "is much larger than that of a modern European."[6] Coon (1962) observes that Mauer is a large, massive mandible, "but it is not the largest lower jaw yet found." All the teeth were in the jaw when discovered. Coon finds that "although the teeth are not small they are all within the length and breadth ranges of modern man, falling closest in size to those

[1] R. Ruggles Gates, *Human Ancestry from a Genetical Point of View*, Harvard University Press, Cambridge, 1948, pp. 79-81.

[2] William W. Howells, "Homo Erectus," *Scientific American*, Reprint No. 630, 1966, pp. 2-3.

[3] R. Ruggles Gates, *op. cit.*, p. 79.

[4] Carleton S. Coon, *The Origin of Races*, Alfred A. Knopf, New York, 1962, pp. 385-386.

[5] R. Ruggles Gates, *op. cit.*, p. 79.

[6] R. Ruggles Gates, *op. cit.*, p. 242.

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FIGURE 1

Pithecanthropus erectus, or Java Man—as reconstructed by Dr G. H. R. von Koenigswald (Howells, 1966).

of Australian aborigines."[7] Since the Mauer cranium is missing, no estimate can be made of the cranial capacity of this specimen.

The Heidelberg jaw is the oldest known hominid fossil from Europe. It is at least as old as *Pithecanthropus erectus.* Laughlin and Osborne (1967) consider that "the Mauer mandible may be 700,000 to 900,000 years old."[8] The animal bones found at the same level as the jaw "included *Elephas antiquus, Rhinoceros etruscus,* and a lion (*Felis leo fossilis*)."[9] Chard (1969) reports that "about thirty-five genuine tools of human manufacture along with a quantity of stones sometimes claimed to be artifacts" have been found at the Mauer site.[10]

[7] Carleton S. Coon, *op. cit.,* pp. 489-491.

[8] W. S. Laughlin and R. H. Osborne (editors), *Human Variation and Origins,* W. H. Freeman, San Francisco, 1967, p. 210.

[9] R. Ruggles Gates, *op. cit.,* p. 242.

[10] Chester S. Chard, *Man in Prehistory,* McGraw-Hill, New York, 1969, p. 85.

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In the mid-1920s a unique tooth was discovered in the cave of Choukoutien near Peking, China. The tooth was recognized by Dr Davidson Black as being from an early hominid, which he termed *Sinanthropus pekinensis* or Peking Man.[11] Excavations during the following twenty years yielded the remains of more than forty individuals, "including 14 calvaria, 12 mandibles, and 147 teeth."[12]

In addition to the fossil human remains, crude chopping tools, a small flake industry, and the broken and splintered remains of many animals — including species of deer and hyena, a cave bear and a fossil dog — were found in the Choukoutien cave deposits.[13] Subsequent dating by the potassium-argon method has yielded an absolute date of 360,000 years before the present for the *Sinanthropus* remains.[14] This is considerably later in time, however, than either *Pithecanthropus erectus* or *Homo heidelbergensis*. Ashes in the cave deposits indicate that *Sinanthropus* had fire.[15] For many years this was the earliest use of fire known to archaeologists.

TABLE 1
Hominid cranial capacities
(Saller, 1959)*

Number of crania	*Hominid group*	*Mean cranial capacity*	*Range of cranial capacity*
5	*Australopithecidae*	576 c.c.	450-750 c.c.
3	*Pithecanthropi*	871 c.c.	835-900 c.c.
4	*Sinanthropi*	1046 c.c.	915-1225 c.c.
6	Ngandong	1100 c.c.	1035-1225 c.c.
2	Prae-Neanderthal	1175 c.c.	1070-1280 c.c.
6	Neanderthal	1438 c.c.	1300-1610 c.c.
	Homo sapiens (individual values)		900-2000 c.c.
	Homo sapiens (means of racial groups)		1195-1520 c.c.

* In cubic centimeters.

The cranial capacity of the *Sinanthropus* skulls ranged from 915 c.c. to 1225 c.c., with a mean of 1045 c.c. (see Table 1). This is some 15 to 20 per cent larger than the estimated mean cranial capacity of the original *Pithecanthropus erectus* series. Gates reports the most striking features of the *Sinanthropus* skull to be: "(I) a heavy and continuous occipital torus, forming an attachment for the heavy neck muscles, (II) an extremely heavy and continuous supra-orbital torus."[16] Weidenreich (1943) compared *Sinanthropus* in detail with *Pithecanthropus*. He found that the

[11] R. Ruggles Gates, *op. cit.*, pp. 86-88.
[12] Carleton S. Coon, *op. cit.*, p. 430.
[13] R. Ruggles Gates, *op. cit.*, pp. 87-88.
[14] Carleton S. Coon, *op. cit.*, p. 435.
[15] Carleton S. Coon, *op. cit.*, p. 436.
[16] R. Ruggles Gates, *op. cit.*, p. 89.

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skulls agreed in 57 out of 74 anthropological traits, but differed in five characters including cranial capacity and form of the cranial vault. Weidenreich concluded that "*Sinanthropus* differs from *Pithecanthropus* in characters which have not so much phylogenetic as 'racial' bearing."[17]

In 1921 a fossil skull was found in the course of mining operations at Broken Hill in Northern Rhodesia. According to Coon, this skull—which was termed *Homo rhodesiensis* or Rhodesian Man—"shows an incongruous combination of archaic and modern, brutal and delicate features." The cranial capacity of the Rhodesian skull is listed by Coon at 1280 c.c.[18] Large quantities of mineralized animal bones, which "included almost entirely living species, except a rhinoceros," were also found in the cave.[19] The associated artifacts were "rude, chipped implements of quartzite and chert." Clark (1960) estimates the age of similar flake tools found near by to be about 23,000 years old.[20] Howells (1966) suggests that "Rhodesian man may have been alive as recently as 30,000 years ago."[21] Gates thus concludes that Rhodesian man "appears to be a late survival of a very primitive type of man."[22]

II

These discoveries a half-century or more ago of early hominid fossils in widely separated areas of Europe, Asia, and Africa have been supplemented by additional finds of morphologically similar fossil hominids. They include: (1) several skulls found in the 1930s near Ngandong on the Solo River in Java, designated *Homo soloensis* or Solo Man, and dated at about 100,000 years before the present; (2) a jaw and facial fragments from Swartkrans, South Africa, originally named *Telanthropus capensis,* and estimated to be more than 600,000 years old; (3) three jaws and a parietal bone from Ternifine, Algeria, designated *Atlanthropus mauritanicus,* and of approximately the same age as *Pithecanthropus erectus;* (4) a skullcap, identified as the Olduvai Bed II Hominid, from East Africa, and provisionally dated by the potassium-argon method at 500,000 years B.P.; (5) a lower jaw and a skullcap from the Lantian district in Shensi, China, labelled *Sinanthropus lantianensis* or Lantian Man (see Figure 2), and

[17] Franz Weidenreich, "The Skull of *Sinanthropus pekinensis,*" *Paleontologia Sinica,* New Series D., Vol. 10, No. 127, 1943.

[18] Carleton S. Coon, *op. cit.,* p. 623.

[19] R. Ruggles Gates, *op. cit.,* p. 100.

[20] J. Desmond Clark, "Further Excavations at Broken Hill, N. Rhodesia," *Journal of the Royal Anthropological Institute,* Vol. 89 Pt. 2. 1960, pp. 201-232.

[21] William W. Howells, *op. cit.,* p. 9.

[22] R. Ruggles Gates, *op. cit.,* p. 101.

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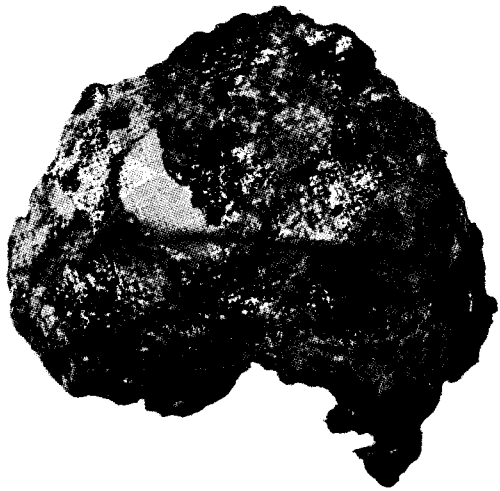
FIGURE 2

The oldest known *erectus* fossil from China—Lantian Man (Howells, 1966).

FIGURE 3



The first known *Homo sapiens* fossil—Vértesszöllös Man (Howells, 1966).

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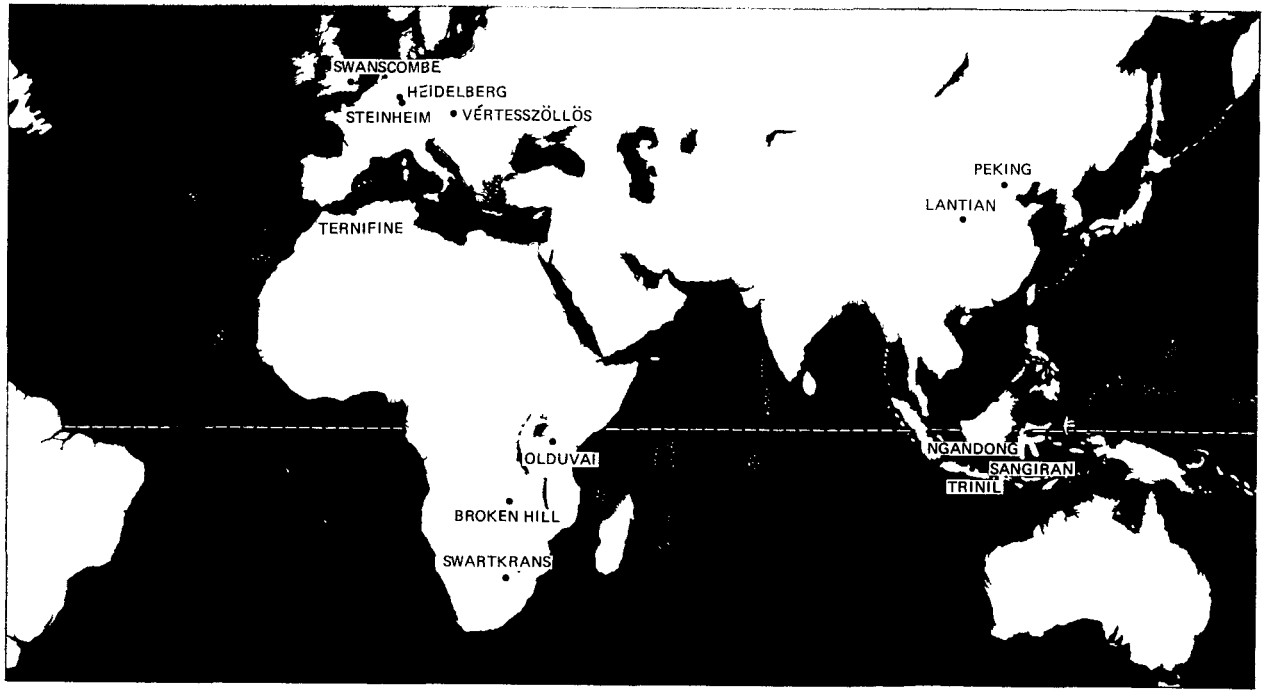
FIGURE 4



Geographical distribution of *Homo erectus* and *Early sapiens* fossils (Howells, 1966).

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believed to be as old as the lowest *Pithecanthropus* geological formation in Java; and (6) an occipital bone found in Vértesszöllös, Hungary in 1965 from an advanced hominid named Vértesszöllös Man (see Figure 3) and estimated to be some 500,000 years old.[23] The geographical distribution of these and the earlier fossil finds is shown in Figure 4.

Although widely distributed in space and time, these fossil hominids are characterized by a number of distinctive physical traits. Howells (1966), for example, writes of "men with skeletons like ours but with brains much smaller, skulls much thicker and flatter and furnished with protruding brows in front and a marked angle in the rear, and with teeth somewhat larger and exhibiting a few slightly more primitive traits."[24] In addition to the cranial and skeletal material, improved dating techniques, accumulation of tools and artifacts associated with the various fossil finds, and revised taxonomic concepts have greatly expanded our knowledge of this stage of hominid evolution.

The older Java and Peking fossils—*Pithecanthropus* and *Sinanthropus*—were soon viewed as "not very different from one another."[25] Both populations were classified as belonging to at least the same genus—*Pithecanthropus*. Taxonomists, such as Mayr (1963)[26] and Campbell (1965),[27] are now inclined to group all the above listed fossils—except for the more advanced Vértesszöllös Man—into one species termed *Homo erectus*. *Homo erectus* represents an earlier stage of human evolution "occupying half a million years of human history and now seen to prevail all over the inhabited Old World."[28] It is further "generally accepted as a probability that the species *Homo erectus* was ancestral to the species *Homo sapiens*."[29]

Carleton Coon in his study of fossil men and racial origins introduces the concepts of grade and line. "A grade is an evolutionary level, marked in man by such features as brain size, forehead slope, size of the eyebrow ridges (if any), tooth size, and the presence or absence of a chin. A line is a geographical race,

[23] William W. Howells, *op. cit.*, pp. 6-8.

[24] *Ibid.*

[25] William W. Howells, *op. cit.*, p. 4.

[26] Ernst Mayr, "The Taxonomic Evaluation of Fossil Hominids," in T. D. McCown and K. A. R. Kennedy (editors), *Climbing Man's Family Tree*, Prentice Hall, Englewood Cliffs, 1963, pp. 372-386.

[27] Bernard G. Campbell, "The Nomenclature of the Hominidae," *Royal Anthropological Institute of Great Britain and Ireland*, Occasional Paper No. 22, 1965.

[28] William W. Howells, *op. cit.*, p. 8.

[29] W. E. Le Gros Clark, *The Antecedents of Man*, University of Edinburgh Press, Edinburgh, Scotland, 1971, p. 24.

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marked by such anatomical details as the shape of the eyebrow ridges, the degree to which the face is either flat or V-shaped, the degree of prominence of the nose, and the structure of the teeth."[30] The species *Homo erectus* can also be "divided into grades of lesser magnitude."[31] Howells (1966), for example, ranks ten subspecies of *Homo erectus* into four grades "in order of evolutionary progress," with a fifth grade being added for the *Homo sapiens* fossil from Vértesszöllös, Hungary." (see Figure 5).[32]

III

The development in recent years of accurate means of absolute dating—such as the potassium-argon method, the uranium-lead method, and analysis of deep-sea sediment sequences—has permitted the more precise placement in time of both the old and the new *Homo erectus* fossil finds. This in turn has enabled estimates to be made of the pace and pattern of hominid evolution during this time period.

In Europe the climate of the Pleistocene was characterized by a glacial sequence of periods of extreme cold alternating with warmer interglacial periods. Four European ice ages are recognized by geologists: Günz, Mindel, Riss, and Würm. Coon (1962), relying upon the calculations of Penck and Bruckner, sets the beginning of Günz at 600,000 years ago, that of Mindel at about 500,000 years ago, that of Riss at some 250,000 years ago, and that of Würm at about 70,000 years ago.

This chronology has been greatly extended by the new methods of dating.[33] Howells (1966) suggests that the first major cold phase of the Pleistocene, corresponding to the Günz glaciation of the Alps, "may date back to as much as 1.5 million years ago."[34] Furthermore, the Günz glaciation is now viewed by some geologists as "primarily an Alpine phenomenon of local significance only," in contrast to the extensive continental ice sheets of the later three European glaciations. Chard (1969), thus, sets the start of the Mindel glaciation at 750,000 years ago. The preceding period is now termed the Mosbachian, whose onset is estimated at about one million years ago. Chard's estimates of the interrelationship between chronology, climatic history, and fossil types is presented in Figure 6.[35]

[30] Carleton S. Coon, "New Findings on the Origin of Races," in T. D. McCown and K. A. R. Kennedy (editors), *op. cit.*, pp. 360-371.

[31] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 336.

[32] William W. Howells, *op. cit.*, p. 5.

[33] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 310.

[34]. William W. Howells, *op. cit.*, p. 5.

[35] Chester S. Chard, *op. cit.*, pp. 60-65.

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FIGURE 5

GRADE	EUROPE	NORTH AFRICA	EAST AFRICA	SOUTH AFRICA	EAST ASIA	SOUTHEAST ASIA
(5)	*HOMO SAPIENS* (VERTESSZÖLLÖS)					
(4)						*(HOMO ERECTUS SOLOENSIS)*
3	*HOMO ERECTUS HEIDELBERGENSIS*	*HOMO ERECTUS MAURITANICUS*	*HOMO ERECTUS LEAKEYI*		*HOMO ERECTUS PEKINENSIS*	
2						*HOMO ERECTUS ERECTUS*
1			*HOMO ERECTUS HABILIS*	*HOMO ERECTUS CAPENSIS*	*(HOMO ERECTUS LANTIANENSIS)*	*HOMO ERECTUS MODJOKERTENSIS*

Evolutionary grades of subspecies of *Homo erectus* and *Early sapiens*—ranked in order of evolutionary progress (Howells, 1966).

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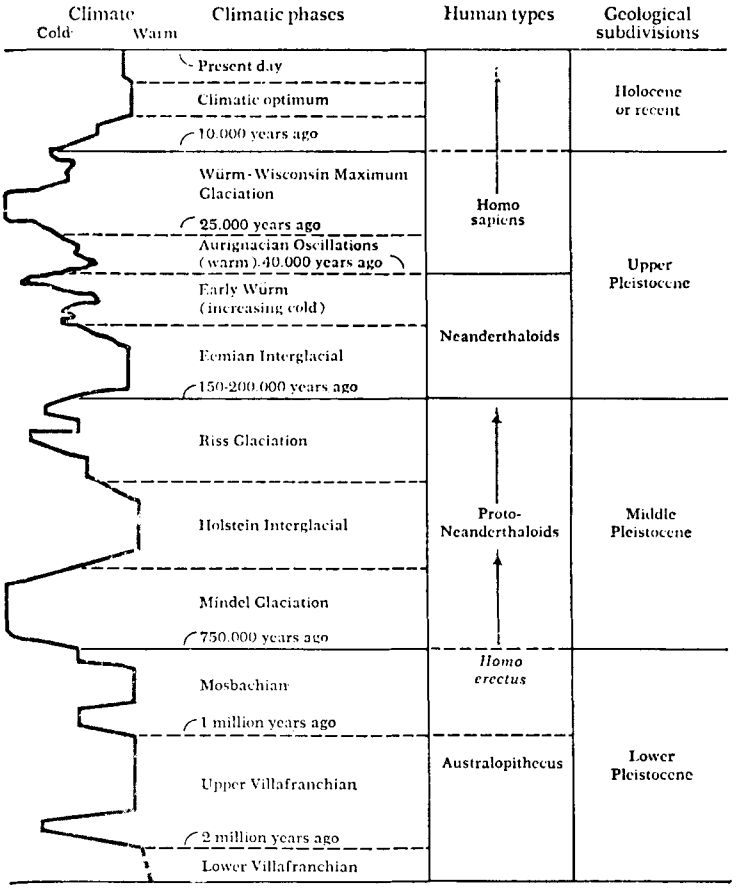
FIGURE 6



The interrelationship between Pleistocene chronology, climatic history, and Hominid types (Chard, 1969).

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The geological period during which *Homo erectus* flourished "occupies the early middle part of the Pleistocene epoch." Howells believes that "the period of time occupied by *Homo erectus* now appears to extend from about a million years ago to 500,000 years ago in terms of absolute dates." However, some subspecies of *Homo erectus* in the tropical regions of sub-Saharan Africa and South-east Asia "may have been alive as recently as 30,000 years ago and may have actually overlapped with modern man."[36] Chard defines the Middle Pleistocene as embracing the Mindel and Riss glaciations, which "may span a period of time from roughly 750,000 to around 150,000 to 200,000 years ago." This time period encompasses "the stage of evolution represented by the later types of the *Homo erectus* group of men and their more evolved successors whom we have called proto-Neanderthaloid, *e.g.*, Swanscombe Man, Steinheim Man."[37]

IV

In the Lower Pleistocene period the Australopithecines possessed a simple tool-making culture, comprising "split pebbles, choppers, and chopping tools." This pebble-tool tradition was relatively uniform throughout the hominid world. In his work on *The Origin of Races* (1962), Carleton Coon suggested that "as far as we know at present, tool-making began in Africa," with this simple technology then spreading as far as South-east Asia and Indonesia.[38]

Recent archaeological discoveries have somewhat modified this hypothesis. Chard (1969) reports that "tools of unquestioned human manufacture that are reliably dated to the Lower Pleistocene" have been found in five localities in East Africa, one in Ethiopia, three sites in Rumania, four in France, two in Germany, and one each in South Africa, Algeria, Chad, possibly in Israel and Turkey and (doubtfully) in China.[39] Tools have been found at the Olduvai Bed I site in East Africa, which is dated at 1.75 million years before the present by the potassium-argon method.

Chard (1969) notes that "there is no proof that even the earliest remains at Olduvai necessarily antedate Late Villafranchian finds in Europe and the Mediterranean area."[40] An undisturbed living site of at least the same age as Olduvai Gorge has been discovered "by Professor Nicolaescu-Plopsor near Bugiulesti in

[36] William W. Howells, *op. cit.* p. 9.
[37] Chester S. Chard, *op. cit.*, p. 92.
[38] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 332-333.
[39] Chester S. Chard, *op. cit.*, p. 80.
[40] Chester S. Chard, *op. cit.*, p. 82.

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Romania, where bones of Late Villafranchian animals had been broken on a lake-shore by hominids." A group of sites of similar age near Craiova, Romania "has yielded about twenty acceptable pebble tools."[41]

The oldest trace of man in Europe, now known, has been found near Menton on the southern coast of France. This site, "dating from a somewhat earlier phase of the Late Villafranchian than any other," is also "at least as old as anything at Olduvai Gorge." A small number of artifacts, "including pebble choppers, associated with bones of Villafranchian animals," has been uncovered in the Grotte du Vallonnet.[42] On the basis of these discoveries, some archaeologists now believe that "the earliest tools in southern Europe antedate anything at Olduvai."* Dr Chard concludes that " the Mediterranean area might equally be proposed as the hearth of toolmaking."[43]

By the Middle Pleistocene tool-making industries had become more complex in some parts of the Old World and regionally differentiated. In addition to choppers and chopping-tools. Coon —following Kenneth Oakley—distinguishes four principal classes of tools: "bifacial hand axes, flakes, blades, and microliths." (see Figure 7).[44] On the basis of these five types of tools, Dr Coon divides the most anciently inhabited parts of the Old World into two major cultural provinces: "a Western, situated in Europe, Africa, and West Asia, and an Eastern, in East Asia and Indonesia."[45] The Western or Acheulean technical tradition was "characterized superficially by the handax (and, later, by the prepared platform techniques for producing superior flake tools)." In East Asia during the Middle Pleistocene, "the original pebble and flake tradition continued slowly to evolve."[46]

Carleton Coon reports that hand axes appeared at the beginning of the Middle Pleistocene in Europe, Western Asia, and most of Africa. The earlier hand axes, which are crudely made, are termed Abbevillian or Chellean. The later ones, which are more finely made, are called Acheulian. In Europe the Abbevillian style " lasted until the beginning of the Mindel-Riss Interglacial." Coon finds that " the Acheulian disappeared as an industry early in the

[41] Chester S. Chard, *op. cit.*, p. 85.

[42] *Ibid.*

* This is very important. Africa has been, in certain places, more intensively the subject of research than many parts of Eurasia. It is my opinion that Africa, in the end, will not be found to be the place of origin of Caucasoid and Mongoloid *Homo Sapiens*.—EDITOR.

[43] Chester S. Chard. *op. cit.*, p. 86.

[44] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 325.

[45] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 328.

[46] Chester S. Chard, *op. cit.*, p. 98.

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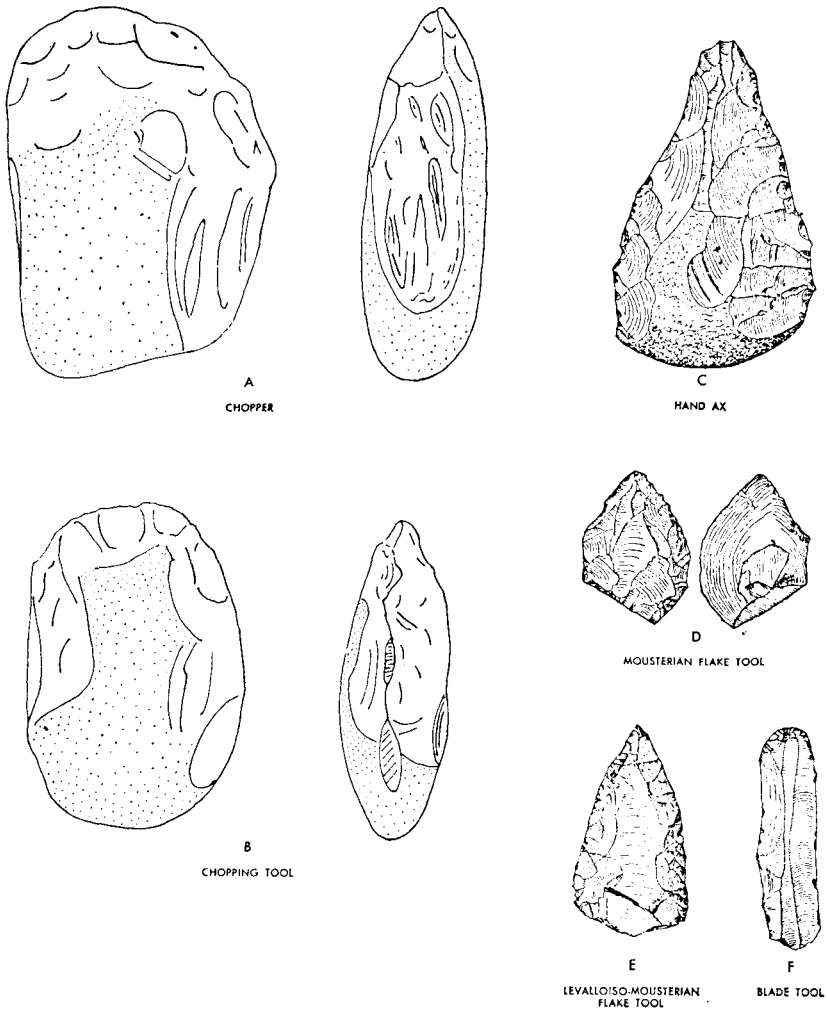
FIGURE 7



Classification of basic tool types: (A) Chopper, from Australia; (B) Chopping tools, from Australia; (C) Hand axe, from England; (D) Mousterian flake tool, from Le Moustier, France; (E) Levalloiso-Mousterian flake tool, from Syria; and (F) Blade tool, from Syria (Coon, 1962).

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Riss-Würm Interglacial, although special kinds of hand axes were made, as rare tools, almost until the First Würm Interglacial, some 10,000 years ago."[47]

Flake tools have been found as elements in hand-axe cultures or as cultures of their own since the beginning of the Middle Pleistocene. Hand axes were completely replaced by flake tools only in the late Upper Pleistocene. Professor Coon finds that "flake tools were most elaborate and specialized in the Near East and Europe, where three partly successive and partly overlapping flake cultures filled the time span from the beginning of the Middle Pleistocene to the end of the Early Würm, some 40,000 years ago, and lasted sporadically even later than that." The three flake cultures were: "the Clactonian, a simple flake industry that involved crude retouching; the Levalloisian, which included prepared cores and Levallois flakes; and the Mousterian, a simple flake industry that involved fine retouching."[48]

In contrast to the more rapid rate of technological change in Europe, Coon considers that "in Africa the rate of change was slower." He finds that "in the Cape Province an Acheulian industry was replaced by a flake industry as late as 30,000 years ago." This was more than 100,000 years later than in Europe and the Near East. The Sangoan hand-axe industry of the forest regions of Central and West Africa continued "well into the Late Pleistocene and perhaps almost until its end."[49]

The earliest *Homo erectus* fossils from East Asia occur in the Djetis beds in Java, which may be 750,000 to 900,000 years old. No trace of tools at this site has been discovered up to now. Chard (1969) contends that "except for one very doubtful site in China (Hsi-hou-tu), there are as yet no tools of Lower Pleistocene age known from East Asia."[50] The first tools in East Asia occur in the Trinil beds of Java with *Pithecanthropus erectus*, and "probably date from the very beginning of the Middle Pleistocene." Throughout South-east Asia and Indonesia "the earliest tools were choppers and chopping tools, with crude flakes."[51]

In northern China the tool types evolved independently throughout the Middle and Upper Pleistocene. In course of time the choppers dropped out of the tool ensemble. The sequence as a whole became essentially "a gradual refinement of the simple flake techniques plus an increasing use of antler and bone."[52] Dr

[47] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 329.
[48] *Ibid.*
[49] *Ibid.*
[50] Chester S. Chard, *op. cit.*, p. 103.
[51] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 330.
[52] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 328-329.

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Chard contends that "the extremely primitive nature of the industry" found with *Sinanthropus* at Choukoutien, China "contrasts strongly with contemporary industries in the West."[53]

Archaeologists stress the observation that "more elaborate and complex tools are found in Europe than in Africa and Asia."[54] Chard (1969), for example, notes that "the highly developed technology of the Acheulian groups of south-western Europe seems not to be paralleled elsewhere." These European Acheulians "became specialized hunters and skilled stoneworkers and constituted what seems to have been the center of technical progress at that time."[55]

The recently discovered Torralba site in Spain, which is dated as early as the late Mindel period, is an example of this advanced technology. Dr Chard contends that at Torralba "we can see the prototypes of tools that were to be of major importance hundreds of thousands of years later and the beginnings of regular use of bone as raw material." Chard finds the roughly contemporary sites of Torralba, Spain and Choukoutien, China to be "an extreme in the contrast" between technologically developed and underdeveloped groups."[56]

Carleton Coon (1962) finds that by the end of the Middle Pleistocene the hand-axe cultures of the West could be regionally differentiated into three groups. By that time "the Chinese and southeast Asian industries had also become recognizably different from each other." In his view the world of the Middle and Upper Pleistocene "was divided into two halves and five regions; an eastern province with a northern and a southern region, and a western province with a Eurasian, a North African, and a sub-Saharan region." Dr Coon contends that these technologically differentiated regions correspond "to the distribution of the five human subspecies near the end of the Pleistocene, before the movements that relocated the Australoids and Capoids when the two dominant northern subspecies, the Mongoloid and the Caucasoid, expanded their territories southward" (see Figure 8).[57]

V

Carleton Coon in his study of fossil man emphasizes "the importance of fire to the physical and cultural evolution of man."[58] According to him, fire has four uses: "frightening off predators,

[53] Chester S. Chard, *op. cit.*, p. 103.
[54] John Buettner-Janusch, *Origins of Man*, John Wiley, New York, 1966, p. 353.
[55] Chester S. Chard, *op. cit.*, p. 109.
[56] *Ibid.*
[57] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 331-333.
[58] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 332.

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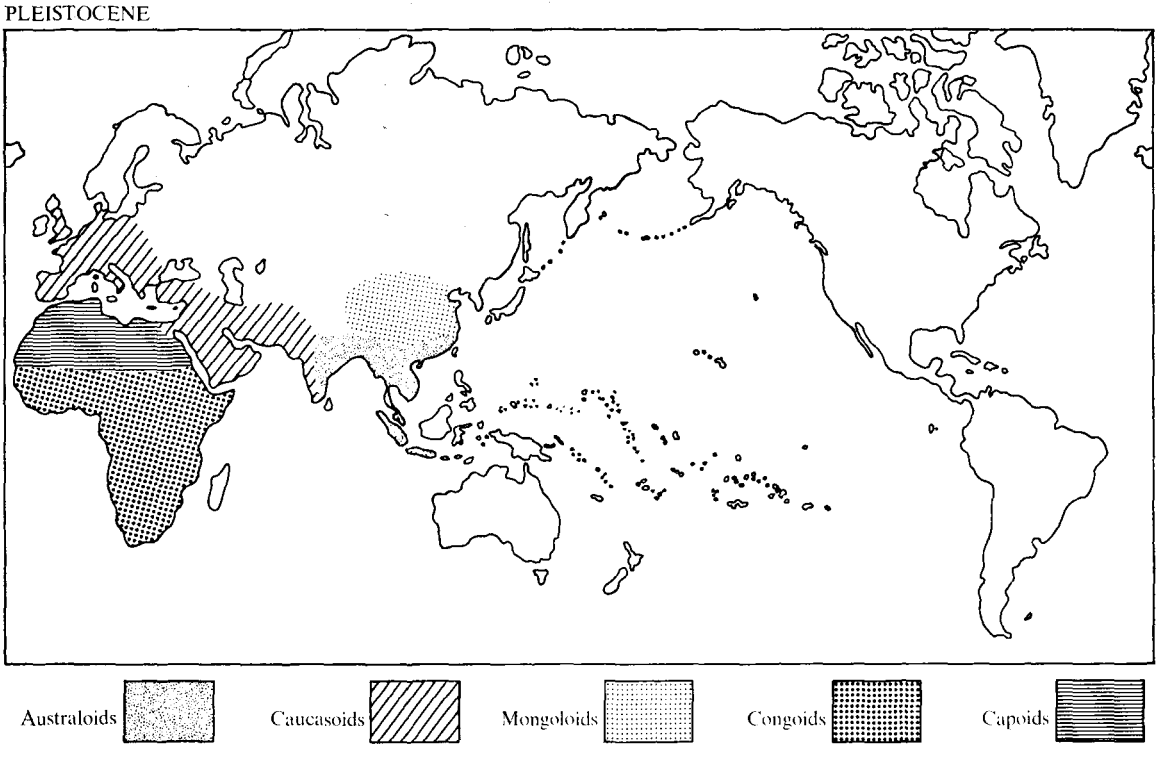
FIGURE 8



Geographical distribution of the five subspecies or races of man in the Pleistocene period some 500,000 years ago (Coon, 1963).

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keeping people warm and dry, cooking food, and providing a spatial nucleus or center for the home territory of a group of people."[59] Thus, the use of fire is viewed as an important element in the origin and development of human society. In addition, the regular use of fire would have greatly extended early man's range of habitation in both Europe and northern China. Chard (1969), for example, concludes that "human occupation of the more northerly environments, especially under the rigorous climatic conditions which now challenged man as a result of the Mindel glaciation, must have been greatly facilitated by, if not in fact dependent on, the use of fire."[60]

Evidence of the early use of fire has been found at a number of European sites and in north China. Dr Coon contends that "if it can be shown that some geographical races got fire before others did, the implication will be that those who had it first were also the first to receive its evolutionary benefits, and that those who obtained it last must have been correspondingly retarded."[61] At the time of publication of *The Origin of Races* in 1962, the first known use of fire was by the *Sinanthropus* population of Choukoutien in north China some 360,000 years ago. Evidence of fire had also been found at Swanscombe, England, in the same level as the Swanscombe skull, which Coon estimated to be over 250,000 years old.[62]

Since then evidence of a much earlier use of fire in Europe has been uncovered. The Vértesszöllös skull, which was found in Hungary in 1965, is placed in the latter part of the Mindel glaciation—500,000 years ago or more. According to Chard (1969) "these people were living successfully in a fairly severe climate with the aid of fire."[63] Dr Chard also reports an "extraordinary living site recently discovered at Nice on the French Riviera, with apparent remains of artificial structures and the oldest known use of fire—considerably earlier than hitherto supposed." This site is estimated to be a million years old.[64] These recent archaeological findings firmly establish the priority of Europe in the usage of this important cultural trait.

In contrast to the early usage of fire in Europe, no such evidence has been uncovered from either Java or sub-Saharan Africa. Not a trace of charcoal or charred bone has been found in the habitation of East Africa "where layer after successive layer of

[59] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 90-91.
[60] Chester S. Chard, *op. cit.*, p. 99.
[61] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 332.
[62] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 91.
[63] Chester S. Chard, *op. cit.*, p. 101.
[64] Chester S. Chard, *op. cit.*, p. 85.

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hand axes, cleavers, and meat bones have been excavated with the most meticulous care." The oldest evidence of fire found up to now in sub-Saharan Africa is only 40,000 years old. Carleton Coon reports that both L. S. B. Leakey and Desmond Clark "have stated their conviction that in East Africa the entire hand-axe period was fireless almost to the end." Dr Coon concludes that "if future excavations confirm this erudite opinion, we shall have one explanation of the extraordinary slow pace that human evolution followed, in the Middle and Late Pleistocene, in Africa south of the equator, and perhaps also south of the Sahara."[65]

Coon (1962) lists 19 fossil skulls as "so different from those of living peoples that they obviously belong in the *erectus* category."[66] Nine are from Java, seven from China, and three from Africa. The cranial capacities of the 12 adult specimens range from 775 c.c. for Pithecanthropus II to 1280 c.c. for the Broken Hill fossil (see Table 2). The mean of the male series is 1119 c.c. and that of the female series 970 c.c.[67]

TABLE 2
*Homo Erectus cranial capacities**
(Coon, 1962)

Fossil crania		*Cranial capacity* *Male*	*Female*
Pithecanthropus	IV	900 c.c.	
Pithecanthropus	I	935 c.c.	
Pithecanthropus	II		775 c.c.
Solo	I		1,035 c.c.
Solo	V	1225 c.c.	
Solo	IX	1135 c.c.	
Solo	X		1,055 c.c.
Sinanthropus	X	1225 c.c.	
Sinanthropus	XI		1,015 c.c.
Sinanthropus	XII	1030 c.c.	
Saldhana		1225 c.c.	
Broken Hill		1280 c.c.	
Mean cranial capacity		1119 c.c.	970 c.c.

* In cubic centimetres—adult specimens only.

Saller (1959) divides the *Homo erectus* crania into a *Pithecanthropus* group and a *Sinanthropus* group. The former has a mean of 855 c.c., with a range of 775-935 c.c. The latter has a mean of 1056 c.c., with a range of 915-1225 c.c. (see Table 3).[68] Thus, on the basis of currently available fossil evidence, it appears that the majority of the Pithecanthropine or *Homo erectus* crania fall in

[65] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 332.
[66] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 337.
[67] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 668.
[68] Karl Saller, *Lehrbuch der Anthropologie*, Gustav Fischer, Stuttgart, Germany, Vol. II, 1959, p. 1215.

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TABLE 3
Hominid cranial capacities
(Saller, 1959)*

Hominid group	*Fossil crania*	*Author*	*Cranial capacity*	*Cranial capacity range* (Min.-Max.)	*Group mean cranial capacity*
Pithecanthropus group	*Pithecanthropus* I	Weidenreich	935 cc		
	Pithecanthropus II	Weidenreich	775 c.c.	775-935 c.c.	855 c.c.
	Sinanthropus III	Weidenreich	915 c.c.		
	Sinanthropus X	Weidenreich	1225 c.c.		
	Sinanthropus XII	Weidenreich	1030 c.c.	915-1225 c.c.	1056 c.c.
East Asian Neanderthal	Ngandong I	Weidenreich	1035 c.c.		
	Ngandong V	Weidenreich	1255 c.c.	1035-1255 c.c.	1145 c.c.
African Neanderthal	Broken Hill	Weidenreich	1325 c.c.	1325 c.c.	1325 c.c.
Neanderthal transition group	Tabun I	Weidenreich	1450 c.c.		
	Saccopastore I	Keith	1270 c.c.		
	Ehringsdorf	Keith	1510 c.c.		
	Skhul V	Sergi	1200 c.c.		
	Teshik-Tash	Gremjackij	1550 c.c.		
	Ganovce	Vlcek	1320 c.c.		
	Gibraltar I	Kappers	1300 c.c.	1200-1550 c.c.	1371 c.c.
Classical Neanderthal	Neanderthal	Boule	1408 c.c.		
	La Quina	Boule	1610 c.c.		
	Le Moustier	Martin	1350 c.c.		
	Circeo	Weinert	1564 c.c.		
	La Chapelle	Sergi	1550 c.c.		
	La Ferrassie	Boule	1641 c.c.	1350-1641 c.c.	1521 c.c.
Diluvial *Homo Sapiens*	Predmost III	Matiegka	1608 c.c.		
	Predmost IV	Matiegka	1518 c.c.		
	Predmost IX	Matiegka	1555 c.c.		
	Predmost X	Matiegka	1452 c.c.	1452-1608 c.c.	1527 c.c.

* Cubic centimetres.

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the range of 1000-1100 c.c. This represents a doubling of the Australopithecine endocranial value.

Krantz (1968) similarly observes that "in the evolutionary step from *Australopithecus africanus* to *Homo erectus*, the most notable anatomical change was a doubling of the brain size. Endocranial capacities increased from about 500 cubic centimetres to around 1000." He views this important step in hominization "as an adaptation to a novel method of hunting which relies heavily on mental time span."[69]

Krantz believes that *Australopithecus africanus* "was primarily a gatherer," who "lived in regions not heavily forested and subsisted primarily on vegetable foods." In contrast, the subsequent *Homo erectus*, who lived "in much the same environment," differed " in that substantial quantities of meat became a regular part of his diet." Dr Krantz conjectures that "*Homo erectus* was a successful big game hunter as well as a gatherer" and that "in some manner the enlargement of the brain is related to this extension of ancient man's ecological niche."[70]

Krantz also notes that "two other aspects of man's anatomy, the hands and pelvis, appear to have achieved their modern condition in about this general time range." A fully erect posture was firmly established by further changes in the pelvis of *Homo erectus*. This more efficient bipedalism permitted successful big game hunting of a type, which Krantz terms " persistence hunting." Persistence hunting consists of continuous pursuit of the quarry—sometimes for as long as one or two whole days. This requires "the ability to keep the task constantly in mind for several days and to anticipate the results well into the future."[71]

Rensch (1956) and his associates tested the learning abilities and memory retentions in pairs of related species of animals of contrasting body and brain sizes. "In all cases the species with the larger brain proved to have the greater memory."[72] On the basis of Rensch's experiments, Dr Krantz believes that "the increase of some 500 c.c. of endocranial volume in *Homo erectus* must certainly represent a tremendous increase in his memory." This increase in brain size to about two-thirds that of modern man "should have permitted *Homo erectus* to engage in persistent hunting in a manner approaching that observed in recent man."[73]

[69] Grover Krantz, "Brain Size and Hunting Ability in Earliest Man," *Current Anthropology*, Vol. 9, No. 5, 1968, p. 450.

[70] *Ibid.*

[71] *Ibid.*

[72] Bernhard Rensch, "Increase of Learning Capability with Increase of Brain-Size," *The American Naturalist*, Vol. 90, No. 851, 1956, pp. 81-95.

[73] Grover Krantz, *op. cit.*, p. 450.

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Krantz regards persistence hunting as an important factor in "the selective forces that brought about the transformation from *Australopithecus* to *Homo*." Small increments in the size of the *Australopithecus* brain could have been of selective advantage "by increasing the time and distance that the possessor would be able to pursue his mobile food supply." Selective pressure would favor those individuals with larger brains and better memories, since "the reward in food for successful pursuit of game tended, on the average, to go to those individuals with the greater mental time spans."[74]

VI

Endocranial casts have been constructed from a number of Pithecranthropine or *Homo erectus* crania. Discussions of the features of the *Homo erectus* brain have been provided by Ariëns-Kappers (1929),[75] Gates (1948),[76] Connolly (1950),[77] Coon (1962)[78] and Kotchetkova (1960).[79]

Ariëns-Kappers (1929) calculated six brain indices for *Pithecanthropus erectus* and compared them to similar data derived from the brain casts of hylobates, the orang-utan, the chimpanzee, the gorilla, Rhodesian Man, and a modern Dutch man. The fissuration of the frontal lobe was found to be "much more complicated than that in hylobates, whose frontal fissures have a very simple character and are less numerous," while "the frontal lobes compared to that of the chimpanzee show a frontally more stretched course of the sulci." In addition, "the foot of the mid-frontal convolution is larger in *Pithecanthropus*."[80]

Ariëns-Kappers also found the frontal and post-temporal region to be more developed in *Pithecanthropus* than in living anthropoids, although the greatest increase seemed "to occur in the parieto-occipital region." He concluded on the basis of these features, "and also by its brainweight (taxed on about 970 gr.) and cephalization coefficient," that *Pithecanthropus* "stands between the greatest recent anthropoids (max. brainweight less than 600

[74] Grover Krantz, *op. cit.*, p. 450-451.

[75] C. U. Ariëns-Kappers, *The Evolution of the Nervous System in Invertebrates, Vertebrates, and Man,* DeErven F. Bohn, Haarlem, Holland, 1929, pp. 221-247.

[76] R. Ruggles, Gates, *op. cit.*

[77] Cornelius J. Connolly, *External Morphology of the Primate Brain,* C. C. Thomas, Springfield, Illinois, 1950, pp. 331-349.

[78] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 305-656.

[79] V. I. Kotchetkova, "L'évolution des régions specifiquement humaines de l'écorce cérébrale chez les Hominidés." *Proceedings, 6th International Congress of Anthropological and Ethnological Sciences, Paris,* Vol. 1, 1960. pp. 623-630.

[80] C. U. Ariëns-Kappers, *op. cit.*, pp. 224-228.

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gr.), and man (average of European men and women 1300 gr.; of Australian ditto 1160 gr.)."[81]

Connolly (1950) found that the endocast of *Pithecanthropus* shows the simplest fissural pattern in the frontal region. The endocast of *Sinanthropus* (*i.e.*, Weidenreich's Skull XII) "has also very distinct fissural markings on the frontal region, especially on the left side." Dr Connolly noted that "the principal furrows can be identified in this region and in conformity with its greater height there are more sulcal impressions and the pattern is more complex than in *Pithecanthropus*." Furthermore, "there are more transverse running furrows on this cast of *Sinanthropus* and hence less zonation of the frontal lobe than in *Pithecanthropus*."[82]

Coon (1962) compared the features of the brain cases and endocranial casts of several specimens of *Pithecanthropus, Sinanthropus,* and a later Javan population known as *Homo soloensis* or Solo Man. On the basis of examining the inside surfaces of the adult skulls of all three populations, he found that all "had a wide separation between the frontal and temporal lobes. Each of them has a pronounced internal ridge or Sylvian crest which is rudimentary or absent in fossil European skulls and modern crania. . . ." Dr Coon also observed that the frontal region in *Sinanthropus* "is quite different" from that in *Pithecanthropus,* with the frontal bone rising steeply to form a brow ridge.[83]

The paths of the middle meningeal arteries, which feed the outer sheath of the brain, could also be determined from the endocranial casts. Dr Coon classified the branching pattern of the imprint of the arteries in the parietal region into two types: (A) a simpler type, which "forks little"; and (B) a more complex type, which covers "the surface of the brain which they feed more closely and finely" and "are not as widely separated." He finds that type A "is characteristic of the Australopithecines, *Pithecanthropus, Sinanthropus,* and apparently of Solo." On the other hand, type B "is characteristic of the earliest skulls from Europe, which come from the Second or Great Interglacial, and of modern men in general."[84]

Comparison of the brain cases of *Sinanthropus* and Solo Man led Coon to conclude: "(1) Although identical in size, the two sets of brains were different in shape. (2) Although he lived at least 200,000 years before Solo man, *Sinanthropus* was already more highly evolved than the latter in the reduction of bony superstructure about the brain case, just as he had a larger brain than

[81] C. U. Ariëns-Kappers, *op. cit.*, p. 229.

[82] Cornelius J. Connolly, *op. cit.*, pp. 331-339.

[83] Carleton S. Coon, *The Original Races, op. cit.*, pp. 440-442.

[84] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 441-443.

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his own probable contemporaries, the *Pithecanthropi* of Trinil." Dr Coon further believes that these differences "show that in different anthropogeographical regions evolution proceeded at different rates during the Pleistocene."[85]

Sir Grafton Elliot Smith (1928) made an endocranial cast of the skull of the relatively recent Rhodesian man.[86] According to Coon, "the track of the meningeal artery was simple, as in *Sinanthropus*, Solo and Ternifine. . . ." There was a large Sylvian crest. Furthermore, the prefrontal, upper parietal, and lower temporal areas of the cortex were poorly developed in comparison with those of living men and of the Neanderthals."[87]

Kotchetkova (1960) conducted a comparative study of the endocranial casts of a series of fossil and living men. In the case of *Sinanthropus*, several prominences were observed "on the surface of the endocranial cast." In order of size, these were located: (1) around the extremity of the Sylvian fissure; (2) in the posterior part of the inferior frontal convolution; and (3) in the region of the impression of the coronary suture. Compared to present-day man, the endocranial cast of *Sinanthropus* shows that the focus of intense development of the cerebral cortex is disposed toward "the specifically human regions": (1) the cortical zones of the complex functions of the hand; (2) the language motor zone; and (3) the region of somato-topical movements. Dr Kotchetkova concluded that "the first elements of articulate language" emerged during the *Sinanthropus* stage of evolution.[88]

VIII

Coon (1963) advanced the thesis that "human races were ancient and that they evolved early in five different areas." Races arose as soon as "the primitive ancestors of man had dispersed by migrating from the place where they originated — uncertain but possibly in Africa—into all of the warm parts of the Old World (Eurasia and Africa) which could be reached on foot." Geography, "acting in the guise of natural selection shaping genetically plastic living material," is viewed as the primary factor in the formation of the races of man.[89]

Dr Coon finds that the oldest known human species, *Homo erectus*, is already divided into five geographical races more than

[85] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 439.

[86] Sir Grafton Elliot Smith, "Endocranial Cast," in W. P. Pycraft (editor), *Rhodesian Man and Associated Remains*, British Museum, London, 1928, pp. 52-58.

[87] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 623.

[88] V. I. Kotchetkova, *op. cit.*, pp. 624-626.

[89] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, pp. 360-362.

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a half-million years ago. The five races are: the Caucasoids of Europe and Western Asia, the Mongoloids of Eastern Asia, the Australoids of South-east Asia, the Congoids of Central Africa, and the Capoids of first North Africa and later South Africa. Coon contends that "from the start of the Middle Pleistocene the Old World, in which man arose, was divided into five breeding grounds, sufficiently separated from one another by physical and climatic barriers to permit a human subspecies to evolve almost but not quite independently of its neighbours." Analysis of the archaeological sequences in the five regions further demonstrates that in each of them "tool-making techniques followed essentially but not wholly independent paths."[90]

In his work on *The Origin of Races,* which was published in 1962, Carleton Coon analyzed data from 337 fossil-man sites extending in time from the Lower and Middle Pleistocene to the post-Würm period. At that time the Lower and Middle Pleistocene, which "was the formative period for *Homo erectus* and *Homo sapiens*," was represented by only 14 known sites, or 4 per cent of the total.[91] Dr Coon then grouped the known fossil hominids by time period, evolutionary grade, and racial line (see figure 9). In this classificatory system, three evolutionary grades (*Australopithecus*, *Homo erectus*, and *Homo sapiens*) and five racial lines (Caucasoid, Mongoloid, Australoid, Congoid, and Capoid) were recognised.[92]

According to Coon, the Heidelberg-Swanscombe-Steinheim-Fontechévade-Saccopastore-Krapina-Neanderthal-Upper Palaeolithic Moullians sequence constitutes a Caucasoid evolutionary line. The *Sinanthropus*-Mapa-Tze-Yang-Choukoutien-Upper Cave series comprises a Mongoloid evolutionary line. The *Pithecanthropus*-Solo-Wadjak series represents an Australoid evolutionary line. The Chellean-3-Kanjera-Saldanha-Broken Hill sequence constitutes a possible Negro evolutionary line. The Ternifine-Temara-Rabat-Tangier series is suggested by Coon as a possible Capoid evolutionary line, which would be ancestral to the living Bushmen.[93]

Coon defines a grade as "an evolutionary stage or condition." Following the Australopithecine grade of human evolution, he distinguishes two further grades. "These two differ sufficiently in several pertinent respects to warrant being given the status of separate, successive species, *Homo erectus* and *Homo sapiens*."[94]

[90] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 369.
[91] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 322-324.
[92] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 334-336.
[93] *Ibid.*
[94] *Ibid.*

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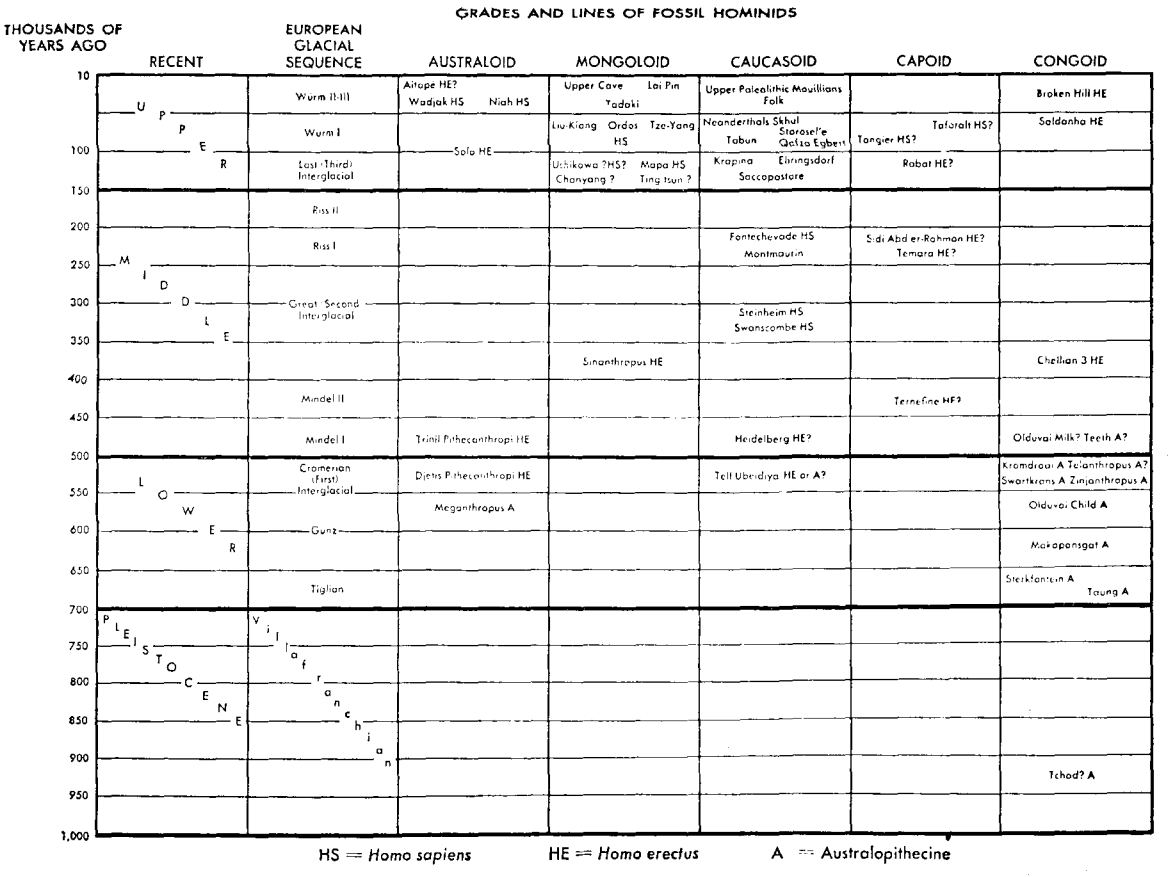

Grades and lines of fossil hominids (Coon, 1962)

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Dr Coon sets the boundary between *Homo erectus* and *Homo sapiens* "on the basis of brain size, the degrees of curvature of the bones composing the cranial vault, and, to a lesser extent, on tooth size, particularly as tooth size is related to brain size."[95]

The 19 fossil crania which Carleton Coon classifies as *Homo erectus* crania are characterised by a number of common morphological traits. These are "small brains, low cranial vaults, heavy brow ridges, and sloping foreheads." In addition, "the palates and teeth that are preserved are big; and the available lower jaws that match these skulls lack chins." Professor Coon then concludes that the differences between the two species (*i.e., Homo erectus* and *Homo sapiens*), "one of which evolved by succession out of the other, are concerned with intelligence, self-control, and the abilities to provide food efficiently and to get along well in groups."[96]

Coon observes that "the size of the human brain is related to a capacity for performance in thinking, planning, communicating, and behaving in groups, as leader, follower, or both."[97] He sets the approximate threshold between the brain-size ranges of *Homo erectus* and *Homo sapiens* "at about 1250 to 1300 c.c., with the expectation that some of the fossil *sapiens* skulls will, like many modern ones, be smaller." In addition to brain size, Dr Coon contends that cranial form is important as a diagnostic trait, so that "the designation of a fossil skull as *erectus* or *sapiens* depends on the total configuration, not on brain size alone."[98]

The *Homo erectus* crania are "long and broad at the base and converge toward the top, both lengthwise and sidewise." In contrast, the *Homo sapiens* crania "bulge more in front and back and at the sides, because a larger brain is set on a proportionately smaller base." Dr Coon finds that the two species of *Homo* can be reliably distinguished by "comparing the three sets of arcs and chords of the skull in sagittal section" (see Figure 10). "*Homo sapiens* is more curved in the frontal and parietal segments than *Homo erectus;* the opposite is true of the occipital segment."[99]

IX

At the time of publication of *The Origin of Races* in 1962, Carleton Coon regarded the European Steinheim and Swanscombe fossils, which date from the Mindel-Riss Interglacial some 250,000 years ago, as "the two oldest specimens of *Homo sapiens* known."

[95] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 369.

[96] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 337.

[97] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 338.

[98] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 341.

[99] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 341-343.

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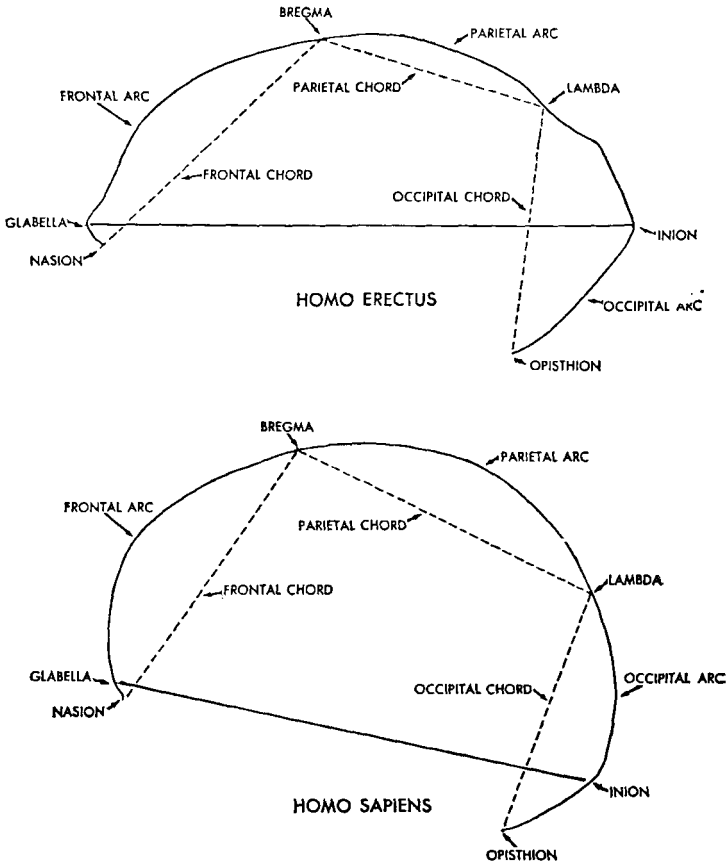
FIGURE 10



Comparison of the sagittal arcs and chords in *Homo erectus* and *Homo sapiens* (Coon 1962).

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Both of these crania are regarded by Coon as female. The cranial capacity of the Steinheim skull is estimated at between 1170 c.c. and 1290 c.c. Coon considers that "this places her near the top of the *erectus* brain-size range, or even over it" and that "she is within the modern female range." The brain cast is regarded as *sapiens* in all known respects. The cranial capacity of the Swanscombe skull is estimated at between 1275 c.c. and 1325 c.c., which "is in the range of that of modern European women." The brain cast of "the occipital lobes and of the cerebellum are *sapiens* in configuration, and the channels of the middle meningeal artery are full and complex."[100] Consequently, Professor Coon concludes that on the continent of Europe "man had reached the threshold of the *Homo sapiens* grade by at least B.C. 250,000."[101]

Since the publication of Coon's work in 1962, the important Vértesszöllös fossil was discovered in Hungary in 1965 by Dr L. Vértes. The specimen is dated to the middle or later part of the Mindel glaciation, some 500,000 years ago. The Hungarian anthropologist, Dr Andor Thoma, estimates that "the cranial capacity was about 1400 c.c., close to the average for modern man and well above that of the known specimens of *Homo erectus*." Professor Thoma concludes that "Vértesszöllös man had in fact reached the *sapiens* grade in skull form and brain size and accordingly has named him a subspecies of *Homo sapiens*."[102] Dr Robert Ardrey (1972) considers the Vértesszöllös fossil "the first known *Homo sapiens*."[103] Dr Howells in his review of *Homo erectus* fossils observes that "Thoma's finding therefore places a population of more progressive, *sapiens* humanity contemporary with the populations of *Homo erectus* 500,000 years ago or more."[104]

The European Riss glacial period of some 200,000 years ago is represented by the Fontéchevade skull. Coon considers this skull a *sapiens* female and estimates the cranial capacity to be 1460 c.c.[105]. The European Third or Last Interglacial extending to about 100,000 years ago is represented by crania from Saccopastore, Italy, Gánovce, Czechoslovakia, Ehringsdorf, Germany, and Krapina, Yugoslavia. All of these crania are regarded by Carleton Coon as fully *sapiens*. On the basis of diagnostic crania such as degree of facial flatness and tooth form, all of the above listed crania—together with the earlier Steinheim and Swanscombe

[100] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 341 and 492-497.

[101] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 341.

[102] William W. Howells, *op. cit.*, pp. 8-9.

[103] Robert Ardrey (with L. S. B. Leakey), "Man, The Killer—A Dialogue," *Psychology Today*, Vol. 6, No. 4, 1972, p. 75.

[104] William W. Howells, *op. cit.*, p. 9.

[105] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 498-500.

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crania—are considered by Dr Coon as Caucasoid and "on the main line of Caucasoid cranial evolution."[106]

The cranial capacities of these European Early *sapiens* crania are listed in Table 4. Coon divides the crania into a male series with a mean of 1357 c.c. and a female series with a mean of 1293 c.c.[107]. If we add Vértesszöllös Man to the male series, this raises the male mean to 1390 c.c. These European endocranial values are considerably higher than the Asian and African *erectus* values listed in Table 2, even though many of the latter fossil crania are more recent in time.

TABLE 4
*European pre-Würm crania**
(Coon, 1962)

	Cranial capacity	
Fossil crania	*Male*	*Female*
Steinheim		1170 c.c.
Swanscombe		1275 c.c.
Fontéchevade		1460 c.c.
Saccopastore 1		1200 c.c.
Saccopastore 2	1300 c.c.	
Gánovce	1320 c.c.	
Ehringsdorf		1450 c.c.
Krapina C		1200 c.c.
Krapina D	1450 c.c.	
Mean cranial capacity	1357 c.c.	1293 c.c.

* In cubic centimeters.

The European Early *sapiens* crania are, however, smaller than their successors—the European "Classic" Neanderthals, the European Upper Palatolithic peoples, and the living European peoples. All of these groups have mean cranial capacity values for male series around 1500 c.c. It is, nevertheless, remarkable that the mean cranial capacity value of a series of European fossil crania dating from 500,000 to 100,000 years ago is higher than the mean cranial capacity found among living African Negroes, Australian Aborigines, and other tropical primitive peoples. Dr Wilfrid Hambly, in a comprehensive study of the relation between race and cranial capacity, calculated the mean adult male cranial capacity of African Negroes to be 1346 c.c., that of Melanesians to be 1345 c.c., and that of Australian Aborigines to be 1294 c.c.[108]

Outside Europe the pace of evolution proceeded more slowly. In north China the *Sinanthropus* crania from Choukoutien are classified as *erectus* on the basis of brain size and cranial form. The site is dated at 360,000 years B.P. Yet European crania from

[106] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 498-511.
[107] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 671.
[108] Wilfrid D. Hambly, "Cranial Capacities, A Study in Methods," *Fieldiana-Anthropology*, Vol. 36, No. 3, 1947, pp. 26-73.

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500,000 years B.P. are large-brained and fully *sapiens*. The tool technology of Choukoutien is regarded as crude and primitive compared to the contemporaneous site of Torralba, Spain. However, *Sinanthropus* did possess the use of fire.

A fragmentary human skull from Mapa in the Chinese province of Kwangtung, which is dated to the Late Middle or Early Upper Pleistocene, is considered by Coon as seeming "to stand at the threshold between the two grades of *Homo*."[109] A female skull from Tze-Yang in the Chinese province of Szechuan has been dated at about 150,000 years of age. Dr Coon regards this skull as the earliest known from East Asia "to have crossed the evolutionary threshold between *Homo erectus* and *Homo sapiens*."[110] The cranial capacity is estimated at 1210 c.c., which is on the low side. Furthermore, Carleton Coon considers that the "skull shows several archaic features" and that the impressions of the middle meningeal artery on the inner surface of the parietals "are archaic in pattern."[111]

All the crania found up to now in East Asia later than Tze-Yang "are *sapiens* also."[112] For example, the Liu-Kiang skull from Kwangsi in China, which is believed to be male, is large and capacious and "fully modern in the dimensions of its brain case." The cranial capacity is estimated to be 1480 c.c. with the skull being dated to the Upper Pleistocene some 100,000 years ago.[113] On the basis of tooth form, degree of facial flatness, and other morphological criteria, all of these crania are classified as Mongoloid. Dr Coon therefore contends that the series extending from *Sinanthropus* to the Choukoutien Upper Cave People at the end of the Upper Pleistocene forms a Mongoloid line of descent leading to "the modern Chinese, Indonesians, Siberians, Japanese, and American Indians."[114]

XI

Weidenreich (1945)[115] and Gates (1948)[116] contended that the *Pithecanthropus*-Solo-Wadjak series forms an Australoid evolutionary line. Coon (1962) also believes that this fossil record "follows

[109] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 462-464.
[110] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.
[111] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 465-467.
[112] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.
[113] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 467-469.
[114] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.
[115] Franz Weidenreich, "The Keilor Skull: A Wadjak Type from Southeast Australia," *American Journal of Physical Anthropology*, Vol. 3, No. 1, pp. 21-23.
[116] R. Ruggles Gates, *op cit.*, pp. 144-165.

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what seems to have been a single polytypic line through several evolutionary grades, including the transition from *Homo erectus* to *Homo sapiens*."[117] He places Solo a grade (or a half grade) above *Pithecanthropus* and below the living Australian Aborigines on the basis of brain size. Dr Coon thus obtains the following evolutionary sequence for males: "*Pithecanthropus* = 900 c.c.; Solo = 1150 c.c.; living Australians = 1350 c.c."[118]

The various *Pithecanthropus* fossils are estimated to be from 500,000 to more than 700,000 years old. Those from the Djetis beds in Java are older than the ones from the Trinil beds. The larger-brained Solo fossils are considered to be between 150,000 and 75,000 years old. Coon regards the Solo crania as "still *erectus*," but of "a higher grade than their predecessors."[119] Comparing the Solo skulls with the Djetis and Trinil *Pithecanthropi*, Dr Coon finds that "the three sets of bones complement each other, and that they show a well-marked continuity over a period of as much as 400,000 years, in a nearly constant environment, and at a slow rate of evolution for man." The wet tropics of Java provided "a minimum of environmental change and probably little if any advance in technology."[120]

Carleton Coon (1963) believes that "the Australoids had begun to cross the threshold from *erectus* to *sapiens* some 40,000 years ago."[121] This is based upon the C-14 dating of an Upper Pleistocene skull from Niah Cave in North Borneo. According to Coon, this skull is "definitely *sapiens*, and equally definitely Australoid."[122] On the island of Java two fossil skulls were discovered at Wadjak, which are "dated probably no more than 10,000 years ago." These skulls, which are "one brain-size grade above the Solo skulls," are "fully evolved members of the species *Homo sapiens*" and "identical with those of living Australian Aborigines."[123]

Three skulls found in Australia—Keilor, Talgai, and Cohuna —which are believed to be less than 10,000 years of age, "definitely link the living Australian Aborigines to the succession of four Pleistocene populations in Java."[124] In the view of Dr

[117] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 374.

[118] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 393.

[119] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, pp. 367-368.

[120] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 397-401.

[121] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.

[122] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 412.

[123] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.

[124] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 410.

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Coon, the Mongoloid ancestors of the Burmese, Thais, Indochinese, Malays, and Indonesians "arrived in their present homes quite late." He believes that the southward movement out of China "began in the postglacial Mesolithic" and "reached its peak in historic times."[125]

XII

Coon (1962) considers that nine specimens or sets of specimens from Africa, beginning with the Early Middle Pleistocene Chellean-3 fossil from East Africa and terminating with the Post-Pleistocene Asselar skeleton from the Sahara, form an evolutionary line ancestral to the living African Negroes. According to Dr Coon, the fossils "begin with what is clearly a *Homo erectus* brain case and end with skeletons that are primitively *sapiens*."[126]

The Chellean-3 skull from Olduvai Gorge in East Africa is dated by Argon-40 analysis at 360,000 years before the present, which is contemporaneous with *Sinanthropus* of north China. The skull has very large brow ridges and a sloping forehead, which Coon considers "the hallmarks of the *Homo erectus* grade." The cranial capacity is estimated at between 1100 and 1200 c.c. Hand axes appear for the first time at Olduvai Gorge. However, Coon notes that "these hand axes are few in number, compared to the cruder tools, and less skillfully fashioned than those made in Europe at the same time."[127]

Four specimens were found by Leakey at Kanjera in East Africa in 1932. Coon believes that "they are probably of Upper Pleistocene date," but "could be only 40,000 to 30,000 years old." The cranial capacities of two of the skulls are estimated to be between 1350 c.c. to 1400 c.c. However, "the endocranial cast shows an enlarged *area striata* (the visual region of the occipital lobes) and an ill-filled parietal region, as in the *Homo erectus* specimens from Java and China and in some modern Australian Aboriginal skulls." Coon thus concludes that "whatever their date, these specimens are a primitive grade of *Homo sapiens*, and are probably Negro."[128]

A skullcap from Saldanha Bay near Capetown, South Africa is regarded by Coon as "probably 40,000 years old or older." The cranial capacity is estimated to be between 1200 and 1250 c.c. Dr Coon believes that the Saldanha Bay skullcap "closely resembles morphologically" the Chellean-3 skullcap, although it is "several hundreds of thousands of years younger." He concludes that in

[125] Carleton S. Coon, *The Origin of Races*, *op. cit.*, p. 421.
[126] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 611-614.
[127] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 614-617.
[128] Carleton S. Coon, *The Origin of Races*, *op. cit.*, pp. 618-619.

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grade it is "equivalent to the larger skullcaps from Solo and Choukoutien, and is a classic example of *Homo erectus*."[129] The Broken Hill skull, also known as Rhodesian Man, is considered to be some 25,000 to 30,000 years old. Coon classifies this skull as *erectus*, on the basis of the brow ridges, palate, and teeth, which "match in size those of the much earlier *Pithecanthropus* skulls."[130] However, the face and tibia are mostly Negro.

Two later post-Pleistocene skulls from South Africa continue the Chellean-3 to Rhodesian line in the view of Professor Coon. They are the Cape Flats skull and the Border Cave skull. The former had a cranial capacity of only 1230 c.c., while the latter is estimated at 1450 c.c. The endocranial cast of the Cape Flats skull "reveals the same primitive features seen in the Broken Hill skull" and "indicates little or no advance in the shape of the brain of the line to which it seems to belong." Coon concludes that "the Cape Flats and Border Cave skulls were those of Negroes, and the Cape Flats skull had not evolved far beyond the *erectus-sapiens* threshold."[131]

Analysis of both the physical remains and the material cultures in sub-Saharan Africa from the Middle Pleistocene onward indicates a much slower pace of evolutionary change in comparison to Europe. Furthermore, "the farther south one goes, the slower the pace of human evolution and the greater the time lag in the procession of Paleolithic industries."[132] J. Desmond Clark (1958) in his review of "Early Man in Africa," observes that from the time of Rhodesian Man forward "the men of Africa began to lag behind Europe and Asia in cultural and mental development." Thus, by the end of the Pleistocene, some 10,000 years ago, "the stream of human progress had shifted to the Near East and Western Europe, and lower Africa had already become a backwater. Indeed, in many parts of Africa men were still living in a Stone Age culture up to only a few hundred years ago."[133]

Clark (1958) also discusses possible reasons for the "cultural and mental stagnation" of Africa. He suggests that "in Western Europe the hardships and precarious living of the last ice age must have forced man to become inventive and resourceful in order to survive." In contrast, in much of Africa, "rainfall was plentiful, food abundant and existence comparatively easy. The

[129] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 619-621.

[130] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 371.

[131] Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 630-633.

[132] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 614.

[133] J. Desmond Clark, "Early Man in Africa," *Scientific American*, Reprint No. 820, 1958, p. 7.

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old ways of finding a living were good enough."[134] Thus, climate and environment would have acted as selective factors to mold differentially reproductively isolated populations in Europe and Africa.

XIII

Coon (1963) regards the Ternifine-Tangier series as a possible Capoid evolutionary line.[135] The Ternifine fossils consist of a right parietal bone and three mandibles, dated to the Early Middle Pleistocene more than 400,000 years ago. Dr Coon finds that the jaws and teeth resembled those of *Sinanthropus,* with the skull being "apparently *erectus* in general form."[136] Fossil finds consisting of mandibles from Sidi Abd er-Rahman and Temara, Morocco continue the series. A piece of a child's maxilla found near Tangier, Morocco was dated to Würm I less than 100,000 years ago. According to Coon, these specimens form a single evolutionary line, which is "certainly not Caucasoid, nor especially Negroid."[137]

Coon (1963) observes that "the members of this race were replaced about 10,000 years ago by the Caucasoid ancestors of the living North African Berbers." Dr Coon suggests that "the Ternifine-Tangier folk fled into the Sahara and then migrated southward along the East African highlands to . . . South Africa."[138] In his work on *The Origin of Races* (1962), he presents archaeological, anatomical, and geographical evidence to support the view that these early North Africans were the ancestors of the Bushmen of South Africa.[139]

The Singa skull from the Sudan, the Homa Shell-Mound skulls from Kenya, the Boskop and Florisbad skulls from the Transvaal, South Africa would then serve to link the North African Ternifine-Tangier series with the living Bushmen and Hottentots of South Africa to form a Capoid evolutionary line. All of these crania are *sapiens* and post-Pleistocene—probably less than 10,000 years of age.[140] In contrast to the living Capoids, the skeletal and cranial remains indicate that the ancestors of the Bushmen were "large, unreduced, and not infantile."[141] Coon, therefore, concludes

[134] J. Desmond Clark, *op. cit.,* p. 4.

[135] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.,* pp. 369-370.

[136] Carleton S. Coon, *The Origin of Races, op. cit.,* p. 595.

[137] Carleton S. Coon, *The Origin of Races, op. cit.,* p. 600.

[138] Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.,* p. 370.

[139] Carleton S. Coon, *The Origin of Races, op. cit.,* pp. 600-602.

[140] Carleton S. Coon, *The Origin of Races, op. cit.,* pp. 636-645.

[141] Carleton S. Coon, *The Origin of Races, op. cit.,* pp. 640-641.

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that the pedomorphism and partial dwarfing of the living Bushmen "began no more than eight or nine thousand years ago," after their arrival in their historic homeland of southern Africa.[142]

XIV

The accumulation of additional *erectus* or Pithecanthropine fossils and the development of accurate methods of absolute dating have permitted assessment of the pace and pattern of evolution at this stage of hominid evolution. The picture that now emerges is one of "unequal rates of evolutionary change in widely dispersed and partially isolated races of polytypic species." Mayr (1963), for example, suggests that "even though *Homo sapiens* unquestionably descended from *Homo erectus,* it is quite possible, indeed probably, that some races of *Homo erectus* still persisted when other parts of the earth were already populated by *Homo sapiens*."[143]

In Europe "the period of time occupied by *Homo erectus* now appears to extend from about a million years ago to 500,000 years ago in terms of absolute dates." Revised estimates of the age of Heidelberg Man currently date this fossil to perhaps 900,000 years before the present. Chard (1969) thus concludes that "at Mauer, near Heidelberg in Germany, we have the oldest firmly dated specimen of a *Homo erectus* type of man . . . "[144] The Vértesszöllös fossil find then "places a population of more progressive, *sapiens* humanity" in Europe some 500,000 years ago.[145]

Outside Europe *sapiens* fossils appear much later in time. In China the first *sapiens* crania appear about 150,000 years ago, while in South-east Asia "the Australoids had begun to cross the threshold from *erectus* to *sapiens* some 40,000 years ago."[146] In sub-Saharan Africa the *erectus* fossil, Rhodesian Man, "may have been alive as recently as 30,000 years ago and may have actually overlapped with modern man."[147]

Mayr (1963), in his review of hominid phylogeny, contends that "there were widespread polytypic species with more advanced and more conservative races," with one or several of the advanced races giving rise "to the next higher grade."[148] He suggests that "it is thinkable that . . . Heidelberg Man was the first population of *Homo erectus* to reach the *sapiens* level" and that "it is possible

142 Carleton S. Coon, *The Origin of Races, op. cit.*, pp. 645-649.

143 Ernest Mayr, *op. cit.*, p. 378.

144 Chester S. Chard, *op. cit.*, p. 85.

145 William W. Howells, *op. cit.*, p. 9.

146 Carleton S. Coon, "New Findings on the Origin of Races," *op. cit.*, p. 368.

147 William W. Howells, *op. cit.*, p. 9.

148 Ernest Mayr, *op. cit.*, p. 377.

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that *Homo erectus* persisted in Africa as *rhodesiensis* and in Java as *soloensis* at a time when European populations clearly had reached *Homo sapiens* level." This possibility is regarded by Dr Mayr as "by no means remote, in view of the many polytypic species of recent animals in which some races are highly advanced and others very primitive."[149]

Carleton Coon in his work on racial origins contends that over half a million years ago *Homo erectus* was "perhaps already divided into five geographic races or subspecies." These five races evolved in different directions and at different rates of speed in breeding grounds separated from one another by physical and climatic barriers. Dr Coon thus concludes that "*Homo erectus* then evolved into *Homo sapiens* not once but five times, as each subspecies, living in its own territory, passed a critical threshold from a more brutal to a more *sapiens* state."[150]

Coon (1959) also finds that "human evolution proceeded during the latter part of the Pleistocene, at an accelerated pace, particularly among Caucasoids and Mongoloids of the Palaearctic region."[151] Consequently, he concludes that "Caucasoids and Mongoloids who live in their homelands and in recently colonized regions, such as North America, did not rise to their present population levels and positions of cultural dominance by accident." This resulted from the setlement by their ancestors of "the most favorable of the earth's zoological regions, in which other kinds of animals also attained dominance during the Pleistocene." Europe and northern Asia "had challenging climates and ample breeding grounds and were centrally located within continental masses."[152] These factors operated as selective forces upon the populations of the regions. Hence, the development of European civilization, which is characterized by complex technology and high culture, has its roots in biological and evolutionary processes dating back to the Late Lower and Early Middle Pleistocene.

XV

In summary, fossil finds uncovered half a century or more ago in widely separated areas of Europe, Asia, and Africa provided evidence of an earlier hominid stage of evolution. These early finds comprised *Pithecanthropus erectus* from Java, *Sinanthropus* from north China, Heidelberg Man from Europe, and Rhodesian Man from sub-Saharan Africa. Subsequently, additional finds of morphologically similar fossil hominids have been made throughout

[149] Ernest Mayr, *op. cit.*, pp. 337-378.
[150] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 656.
[151] Carleton S. Coon, "Race and Ecology in Man." *Cold Spring Harbor Symposia Quantitative Biology*, Vol. XXIV, 1959, pp. 150-160.
[152] Carleton S. Coon, *The Origin of Races, op. cit.*, p. 663.

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the Old World. In addition to the cranial and skeletal material, improved dating techniques, accumulation of tools and artifacts associated with the various fossil finds, and revised taxonomic concepts have greatly expanded our knowledge of this stage of hominid evolution.

The hominid fossils under consideration are distinguished from *sapiens* fossils and living men by a number of morphological traits. These include smaller brains, thicker and flatter skulls, with protruding brows in front and a marked angle in the rear, and somewhat larger teeth. The skeletons, however, are similar to ours. Taxonomists are now inclined to group all of these fossils into one species termed *Homo erectus*, which is regarded as ancestral to *Homo sapiens*. *Homo erectus* represents an earlier stage of human evolution occupying half a million years or more of human history. In Europe the period of time occupied by *Homo erectus* extends from about one million to 500,000 years before the present, while in China the time period is from 750,000 to 150,000 years B.P. In South-east Asia and sub-Saharan Africa, however, primitive *erectus* crania have been discovered dating to as recent as 30,000 to 40,000 years ago, thus overlapping with modern man. The majority of the adult *erectus* or Pithecanthropine crania from Java (*Pithecanthropus* and Solo Man), China (*Sinanthropus*), and Africa (Rhodesian Man) have cranial capacities in the range of 1000 to 1100 c.c. This represents a doubling of the Australopithecine endocranial value. The Early *sapiens* crania from Europe (e.g. Vértesszöllös Man, Swanscombe Man, Steinheim Man), which are contemporaneous with Asian and African *erectus* crania, represent a more advanced hominid stage of evolution. The cranial capacity of these fossils is in the range of 1300 to 1400 c.c.

The expansion of the brain that occurred during this stage of hominid evolution is believed to be correlated with the development of specifically human behavioral attributes, such as speech and enhanced manual dexterity. Neuro-anatomists, who have studied the endocasts of *Sinanthropus* and other *erectus* crania, contend that the greatest expansion of the *erectus* brain occurred in the cortical zones of the complex functions of the hand and in the language motor zones. This in turn would have provided the biological basis for the development of more advanced cultures, characterized by more complex tool traditions and improved methods of hunting.

In the Lower Pleistocene the Australopithecines possessed a simple pebble-tool culture, which was relatively uniform throughout the hominid world. By the Middle Pleistocene tool-making industries had become more complex in some parts of the Old World and regionally differentiated. Carleton Coon finds that from the start of the Middle Pleistocene the Old World was divided

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into five breeding grounds separated from one another by physical and climatic barriers. In each of these five regions tool-making techniques followed essentially but not wholly independent paths.

The three Western cultural provinces in Europe, Africa, and Western Asia possessed the Acheulean technical tradition—characterized by the hand axe and later by the prepared platform technique for producing superior flake tools. In East Asia during the Middle Pleistocene the original pebble and flake tradition continued slowly to evolve. New discoveries of Late Villafranchian tools in Europe and the Mediterranean area indicate that the Mediterranean area may be "the hearth of toolmaking." In any event by the Middle Pleistocene a more rapid rate of technical change was taking place in Europe, where more elaborate and complex tools are found than in Africa and Asia.

Another important human cultural trait which appears during the *Homo erectus* stage of evolution is the use of fire. However, the use of fire occurs much earlier in Europe than elsewhere—with the oldest known use estimated to be a million years of age. Fire is also found at the site of Vértesszöllös Man some 500,000 years ago. Outside Europe the earliest known use of fire is by *Sinanthropus* at the Choukoutien, China site dated at 360,000 B.P. Fire does not appear in South-east Asia or sub-Saharan Africa until some 40,000 years ago.

Carleton Coon advanced the thesis that human races were ancient and that they evolved early in five different areas. *Homo erectus* was perhaps already divided into five geographical races or subspecies over half a million years ago. Thus, the *erectus* fossils can be arranged into five evolutionary lines leading to the five living geographical races of man: the Caucasoids, the Mongoloids, the Australoids, the Congoids, and the Capoids.

The five races of man, however, evolved in different directions and at different rates of speed in their geographically separated breeding grounds. Coon concludes that *Homo erectus* evolved into *Homo sapiens* not once but five times as each sub-species passed a critical threshold to the *sapiens* state. The first *sapiens* crania appears 500,000 years ago in Europe, 150,000 years ago in China, and 40,000 years ago in South-east Asia. In sub-Saharan Africa *erectus* crania are found as recently as 30,000 years ago. The more rapid pace of biological and cultural evolution in Europe and northern Asia is undoubtedly a result of selective adaptation by the Caucasoid and Mongoloid peoples to the more challenging climatic and ecological conditions of their homelands. Consequently, the present population levels and positions of cultural dominance of the Caucasoids and Mongoloids are an outgrowth of biological and evolutionary processes dating back to the Late Lower and Early Middle Pleistocene.

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Race, Nationality and Crime

By NATHANIEL WEYL

The hypothesis which I should like to explore in these pages is that the criminality of races and subraces tends to vary inversely with their intelligence.

This thesis would seem *a priori* plausible on two grounds. The first is that a variety of studies have shown that the average I.Q.s of criminals and prison inmates are significantly lower than those of the populations from which they are drawn. The second is that most crimes seem to be committed by people who are deficient in such positive psychic qualities as foresight and self-control.

The hypothesis would not, however, apply to all types of crime. Such offenses as embezzlement, forgery, fraud, and even operating numbers games, are differentially attractive to people of above-average intelligence. These mentally exacting felonies yield a small proportion of total arrests, convictions, and sentences. Those who engage in them are not typical criminals.

Due presumably to the prevalence of egalitarian attitudes on race among American social scientists, most texts on criminology play down or ignore the vital relationship between criminality and intelligence. For example, the 1970 edition of *The Sociology of Crime and Delinquency* by Marvin E. Wolfgang, Leonard Savitz and Norman Johnston, a volume of 676 oversize pages, containing contributions by about 50 specialists and comprising well over a third of a million words, contains psychological, sociological and pseudo-mathematical analyses that are sometimes technically so sophisticated as to be virtually useless, but never deals with the variable of intelligence.[1] The closest this volume comes to a discussion of I.Q. is an assertion by Guy B. Johnson, one of the Gunnar Myrdal staff of left-wing sociologists, that is such an interesting combination of ignorance and dogmatism, that it is worth quoting in full.[2]

"We readily grant the *possibility* that the Negro differs from the white man in temperament or psyche," Johnson writes, "but we *assume* that *by no stretch of the imagination* can such a factor be a primary determinant of the amount or nature of crime."

[1] Marvin E. Wolfgang, Leonard Savitz and Norman Johnstone, *The Sociology of Crime and Delinquency,* John Wiley and Sons Inc., New York, 2nd edition, 1970.

[2] Marvin E. Wolfgang, Leonard Savitz and Norman Johnston, "*The Negro and Crime,*" *op. cit.,* p. 419. Emphasis supplied.

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Evidence from Pre-war Europe

Interesting data on the relationship between race, nationality and crime in Europe before the Second World War are contained in Willem Adriaan Bonger's *Race and Crime*, published in Holland in 1939 under the title, *Ras en Misdaad*, and reissued in the United States thirty years later.[3] Dr Bonger was Professor of Sociology at the University of Amsterdam and the leading criminologist of the Netherlands. His book was written primarily to refute Nazi race theories and his political convictions are revealed by the fact that he took his own life in May 1940 when the Nazi armies were overrunning France and the Lowlands. Dr Bonger's preferences are for environmentalist explanations of crime. The objective manner in which he presents data on racial differences in criminality are a tribute to his intellectual integrity.

Professor Bonger presents statistics on criminal convictions of Jews, as compared with non-Jews, per 100,000 inhabitants over 14 years old for Germany (1882-1891, 1892-1901, 1909-1910, 1915 and 1916), Austria (1885-1900), Hungary (1904, 1906-1909), Poland (1924-1925) and the Netherlands (1901-1909, 1910-1915, 1919 and 1931-1933). The German data for 1909-1910 are probably as representative as any for the pre-First World War period. They show that Jews committed proportionately two and a half times as many frauds and forgeries as Gentiles. Their conviction rate for "insult" was about 40 per cent higher and they participated about equally with non-Jews in proportion to population in embezzlement and receiving stolen goods. The Jewish rate for theft, however, was 71.1 per 100,000 as against 178.3 for all other components of the population. Their conviction rate was about 40 per cent of the Gentile rate for felonious assault, about half that rate for rape, less than a third for murder and about a fifth for malicious mischief.[4]

This is in accordance with the hypothesis here advanced. In terms of such criteria as Nobel awards for science, representation in the American creative élite, I.Q. scores, educational level and economic status, Jews rank considerably higher than any other national-linguistic or racial group. The considerably lower rates for crimes of violence, which pressupose defective self-control, and for crimes against property, which suggest lack of forethought and inability to earn a living by lawful employment, would be expected. The much higher Jewish crime rates in fraud, forgery and swindling are also unfortunately compatible with above-average intelligence. The higher level of Jewish conviction for insult perhaps reflects a

[3] Willem Adriaan Bonger, *Race and Crime*, Patterson-Smith, Montclair, New Jersey, 1969.

[4] Willem Adriaan Bonger, *op. cit.*, p. 53.

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tendency towards exhibitionism which is not, to the best of my knowledge, correlated either positively or negatively with intelligence.

Netherlands crime statistics are subdivided among Catholics, Protestants and Jews. In convictions for all crimes per 100,000 population older than 10 years, Catholics consistently lead. Thus, in 1901-1909, the Catholic rate was 54.8, the Protestant 40.0 and the Jewish 25.5. By 1931-1933, convictions for crime had increased about five-fold and the formerly law-abiding Jewish community had moved into second place. These figures were: Catholic 302, Jewish 299, Protestant 259. Professor Bonger's explanation for this marked rise in Jewish criminality is that " when the economic crisis in the Netherlands struck them harder than other groups, their economic criminality increased more rapidly than did that of the others."[5] This theory is somewhat vitiated by the fact that Jewish convictions for crimes of violence also increased markedly between 1901-1909 and 1931-1933.

The higher crime rates among Catholics than Protestants would be expected on the basis of the theory that the intelligence of Catholic populations has been weakened over the centuries by the impact of clerical celibacy on the gene pool.

Bonger gives interesting comparisons of murder and non-negligent manslaughter rates per million inhabitants for various European countries during the 1880s and during the 1927-1932 period. In the earlier period, Italy led with 70 homicides per million, followed by Spain with 65 and Hungary with 56. The lowest ranking countries were those of Northwest Europe: Netherlands 3.1, Germany 3.4, England 3.9, Scotland 4.4.

In the later period, the highest murder rates were in Bulgaria, Lithuania, Latvia and Esthonia. Italy and Hungary occupied middle ground. Statistics were not given for Spain. The least homicidal nations were England and Wales, Norway, Sweden, Denmark, Netherlands, Belgium and Ireland in that order.

Whether the apparent shift of the homicidal center from the Mediterranean to the Slavic world during the 40-year period was due to improved crime reporting or to more substantial causal factors is an open question.

In both tabulations, we have essentially an inverse correlation with the geography of intelligence. In a 1963 study, Dr Stefan T. Possony and I attempted to show that creativity and intellect tended to decline progressively as one moves either southward or eastward from Northwest Europe.[6]

[5] Willem Adriaan Bonger, *op. cit.*, p. 59.

[6] Nathaniel Weyl and Stefan T. Possony, *The Geography of Intellect*, Henry Regnery Company, Chicago, 1963.

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Bonger's data show higher crime rates in Catholic than in comparable Protestant countries. In the two periods, the rates for the Netherlands were 3 and 5, those for Belgium were 9 and 7. Similarly, Irish homicide rates were substantially above those of England and Scotland.

The very high homicide rates reported for the Baltic States in the 1927-31 period deserve attention. In this context, it may be significant that Latvians were represented 11 times more than their numbers would warrant in the pre-war membership of the Communist Party of the Soviet Union[7] and were heavily overrepresented in the upper echelons of the Soviet secret police. Nationals of the Baltic states seem to have played a similarly prominent rôle as guard and executioners in the Nazi extermination camps. Reportedly, their rate of mental breakdown under these conditions was markedly lower than that of the Germans they replaced. In Finland, which is racially related to some of the Baltic peoples, V. Verkko found that manslaughter and non-negligent homicide rates were twice to three times as high in the Finnish-speaking as in the Swedish-speaking regions. This distinguished Finnish sociologist added that the murder rate in Finland is about 20 times as high as in the other Scandinavian countries.[8] Whether the propensity of Finns and Esthonians to commit murders and "rude crimes of passion" is related to their Ugro-Finnish ethnic origin or can be explained solely on the basis of their excessive alcoholism is an intriguing question.*

Bonger cites Massachusetts data for 1910 on convictions of assault by country of birth per million inhabitants. Mexicans led, followed by Austria, Italy and Poland. The lowest rates for crimes of violence were found in Switzerland, Denmark, Norway, Sweden, England and Wales, Germany and France in that order.

Commitments to Massachusetts prisons in 1914-22 for murder, manslaughter and criminal assault were 192 per 100,000 for people born in Italy, but only 24 for native-born Americans of American parentage and also for native-born Americans of Italian parentage.[9] Bonger inferred from this that the excessive Italian homicide rates were caused by the adverse Italian *milieu* and not by race. Were this true, the Mafia would long since have disappeared!

[7] Salo. W. Baron, *The Russian Jew Under Tsars and Soviets,* New York, 1964, p. 204.

[8] V. Verkko, *Verbrechen wider das Leben under Körperverletzungsverbrechen,* Helsinki, 1937. Cited by Willem Adriaan Bonger, *op. cit.,* pp. 92-93.

* The Finns and Balts are largely racially *East Baltic,* and it is more likely due to this racial affinity than a historic linguistic origin of the Finns that this phenomenon is due.—EDITOR.

[9] Willem Adriaan Bonger, *op. cit.,* p. 73.

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What Dr Bonger overlooked was that the great majority of the persons of Italian birth in the United States in 1914-1922 came from Sicily and other parts of southern Italy. The native-born of Italian parentage, however, represented an earlier immigration stream and were primarily of north Italian origin. Perhaps the great Italian-Jewish pioneer in criminology, Cesare Lombroso, was nearer the mark when he observed that Sicilian highway robbers are concentrated in an area of heavy Berber settlement.*

Professor Bonger readily conceded that the Mediterranean peoples are more prone to crimes of violence than either the Nordics or the Alpines. A detailed analysis of crime statistics by different regions of Germany and the Netherlands suggested, but not conclusively, that Alpines have a tendency to commit more crimes of violence than Nordics.

Interestingly enough, the factual findings of Dr Bonger confirm the view that Jews and Nordics are probably less inclined to crimes of violence than the other racial groups of Europe; that criminality tends to rise as one proceeds eastward or southward on the Continent; that Catholic peoples have higher crimes rates than Protestant, and that there appears to a be a general tendency for crime rates to correlate inversely with intelligence. This last generalization admits of many exceptions. Thus, the Finns and Esthonians seem to combine a strong propensity to commit crimes of violence with good intelligence. The Jewish tendency towards such financial crimes as fraud, forgery and embezzlement has already been noted.

The low crime rates among Nordics may correlate with Dr Richard Lynn's findings, published recently in THE MANKIND QUARTERLY, that Nordics are less subject to anxiety than other Western racial groups.

CRIME AND THE AMERICAN NEGRO

"The principal thing," Lombrosa[10] wrote almost 70 years ago, "is always . . . the stifling of the primitive, wild instincts. Even if he (the Negro) is dressed in the European way and has accepted the customs of modern culture, all too often there remains in him the lack of respect for the life of his fellow men, the disregard for life which all wild people have in common. To them, a murder appears as an ordinary occurrence, even a glorious occurrence when it is inspired by feelings of vengeance. This mentality is furthered in the Negro by his scorn of his white fellow-citizens and by bestial sexual impulses."

* The Mafia belong to western Sicily, and it was this part which was under Islamic (Berber) rule.—EDITOR.

[10] Cesare Lombroso, *Neue Verbrecher-Studien*, Halle, 1907, p. 15. Translated by Willem Adriaan Bonger, *op. cit.*, pp. 48-49.

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This statement would have been regarded as an absurdity by all educated Westerners 20 years ago. Today, in the lurid light of the Black Panthers and the degeneration of American cities into jungles that are also infernos, one is not so sure.

Certainly, ever since his emancipation from slavery, the American Negro has accounted for a disproportionate share of the crimes committed in the United States. In 1969, the FBI reported that 62 per cent of the persons arrested for murder, 50 per cent of those arrested for forcible rape, 56 per cent of those arrested for major crimes of violence and 34 per cent of those arrested for major crimes against property were Negroes.[11] Since Negroes comprise only 11 per cent of the American population, the Black arrest rate for murder and other major crimes of violence was more than five times the national average, that for forcible rape over four times the average, and that for major crimes against property over three times the average.

During the generation between the Second World War and 1970, the United States embarked on the most ambitious and massive program which any nation has ever undertaken on behalf of its racial minorities. A pertinent question—one seldom asked—is whether this vast uplift and eleemosynary operation has been accompanied by a decrease or an increase in the Negro's proportionate contribution to crime. If the sociological theories which impute Negro criminality to oppression, discrimination and indignity are valid, a decline in the Negro crime rate should have occurred. If, on the contrary, Negro crimes rates during this period rose even more rapidly than the 70 per cent. increase in all serious crimes, then this would seem a *prima facie* refutation of all theories tying Negro crime to white oppression.

The facts are that during the quarter of a century since the end of the Second World War Negro crime has risen considerably more rapidly than crimes by Whites.

In 1945, 45 per cent of those arrested for murder were Negroes. By 1969, the black percentage had risen to 62 per cent. During this same period, the Negro share of arrests for major crimes of violence increased from 43 per cent to 56 per cent of the total.

The most obvious characteristic which Negroes and criminals have in common is below-average intelligence. The American Negro has an average I.Q. approximately one standard deviation below the white average. Four times as many Blacks as Whites fail the armed services mental tests. *While approximately two-thirds of the American white population ranks as average,*

[11] Federal Bureau of Investigation, *Crime in the United States: Uniform Crime Reports—1969*, Washington, 1970, pp. 118-119. The major violent crimes are murder, forcible rape, aggravated assault, and robbery. The major crimes against property are burglary, larceny and auto theft.

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superior or very superior in these mental-test scores, only about a fifth of the Negroes fall into these categories. In other words, based on armed forces examinations, about four-fifths of the American Negro population is mentally subnormal or massively retarded. Moreover, the great educational and economic advances of the Negro in past decades have not changed this picture to his advantage. In fact, there is some evidence that a further decline in Negro intelligence may be occurring and that the I.Q. gap between Whites and Blacks widened significantly between 1950 and 1967.[12]

Despite the fact that the evidence on this point has been expunged from most modern criminology texts, the relationship between crime and intelligence has been known for decades. In general, there is a high negative correlation between the two variables.

The evidence on these points is massive. Here only a few samples can be summarized. In 1939, Frankel made a study of a thousand convicted murderers committed to the state prison at Tranton. The median mental age of 233 native-born Whites tested was 12.7 years; that of the 244 Negroes tested was 10.6 years.[13] A similar investigation of state prison inmates at Joliet, Illinois, between 1920 and 1927 by Tulchin revealed equally massive mental inferiority. However, superior ratings were earned by 19.8 per cent of the White inmates, 6.1 per cent of the Northern-born Blacks and 0.9 per cent of the Southern-born Blacks. When white and Negro felons of the same educational background were compared, the Negroes ranked significantly lower in test scores.[14] Stanford-Binet I.Q.s of white and Negro prisoners in the Western Penitentiary of Pennsylvania yielded an average of 81 for the Whites and 65 for the Blacks.[15] Applying the conventional Terman classifications, one could conclude that the average White convict was dull, but not feeble-minded, whereas the average Black inmate was a moron.[16]

In 1948, Malamud made a study of white and black penitentiary inmates. Again the Negro prisoners were about 10 points

[12] Arthur E. Jensen, "How Much Can We Boost IQ and Scholastic Achievement?" Harvard Education Review, Vol. 39, No. 1, Winter 1969, p. 95; Nathaniel Weyl, Letter to the Editor. *Perspectives in Biology and Medicine*, Vol. 13, No. 1, Autumn 1969, pp. 122-124.

[13] Emil Frankel, "One Thousand Murderers," *Journal of Criminal Law and Criminology*, Vol. 29, 1939, pp. 672-688.

[14] Simon H. Tulchin, *Intelligence and Crime*, Chicago, 1939.

[15] Jess Spirer, *Negro Crime*, Comparative Psychology Monographs, Vol. 16, No. 2, 1940. All these studies are ably summarized by Audrey M. Shuey, *The Testing of Negro Intelligence*, Social Science Press, New York, 1966, second edition, pp. 438-456.

[16] Leona E. Tyler, *The Psychology of Human Differences*, New York, 1966, second edition, p. 367.

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below the Whites in I.Q. The disciplinary cases and problem prisoners tended to be more intelligent than those who made a docile adjustment to incarceration.[17] Finally, Roebuck in 1963 published an analysis of 400 Negro inmates of the reformatory in Lorton, Virginia, by type of crime. The median I.Q. for violators of the numbers laws, that is to say, operators of clandestine gambling enterprises, was 105, or above the national White average. The median I.Q. of all other offenders was 86.[18]

In short, the preponderance of evidence shows that the criminal of both races is a person of much lower than average intelligence. (The exception to this rule is those who commit crimes requiring a high degree of organizing skill, business ability or capacity for deception. Some of these activities — operating numbers games, for instance—are deemed crimes merely because of the prejudices of legislators. In essence, they are no different from other business enterprises.)

Secondly, the Negro criminal is on average of markedly lower intelligence than the white criminal.

Third, the frequency distribution of Negro mental test scores is massively lower than the corresponding White frequency distribution.

If criminal activity is concentrated among people with below-average intelligence and, if the American Negro population is characterized by this condition, then it would seem that the "riddle" of excessive Black criminality can be solved without reference to elaborate environmentalist theories.

In more general terms, criminality seems to be greatest among those races, peoples and classes who are least intelligent and least creative. It is least among the bright and gifted peoples. One of the causes of the frightening and continuous rise in the American crime rate may be the tendency to seek to dissuade potential criminals from anti-social conduct by reason, persuasion and appeasement in cases where their intelligence levels are so low that the threat of retribution is the only efficacious deterrent.

[17] Harold A. Malamud, "A Study of Negro and White Discipline Cases in the Western State Penitentiary of Pennsylvania, Part I, *Journal of Clinical Psychopathology*, Vol. 9, 1948, pp. 108-127.

[18] Julian B. Roebuck, "The Negro Numbers Man as a Criminal Type: the Construction and Application of a Typology," *Journal of Criminal Law, Criminology and Police Science*, Vol. 54, 1963, pp. 48-60.

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Brain, Race and the "Fundamental Dilemma"

By F. J. IRSIGLER

The complexity of the central nervous system is so great, and its rôle in mediation and co-ordination so literally central, that it is the limiting factor as regards both development and evolution of behavior. That means in individual development that a central nervous system of sufficient complexity for co-ordination of any given level of behavior must already be developed and functional when the behavior begins. In evolutionary terms, one of the implications is that learning can not be wholly substituted for prior organization of the central nervous system or, if you like, for the instinctual elements of behavior, because learning is possible only if a sufficiently complex central nervous system *already* exists. In embryology it appears, indeed, that the development of the central nervous system is highly specific from the start. Its architecture is determined altogether by heredity, plus whatever nonspecific modifications may result from extrinsic environmental variations. The structure is not visibly modified by the training effect of its own operations (Sperry).

G. G. Simpson in *Behaviour and Evolution* (1958).

In a recent paper entitled "An Empirical Consideration of Differences Between the Bantu and the European"[1] R. Gayre of Gayre writes: "Whether we can locate some of the marked characteristics in the linguistic field, and the well-developed powers of expression of the Negroids to a greater average development of the temporal lobes, remains to be seen. But somewhere in his brain must be the seal of this marked difference between white and black."

In support of this "empirical conclusion" (as he calls it), Gayre points to the musical and linguistic abilities of the Negroes, "since speech and hearing are located in those [temporal] lobes."

This raises a number of important questions which I propose to discuss without trying, however, to give a full and final answer.

What is involved here are those areas of the human brain which phylogenetically as well as ontogenetically are the latest to develop, that is, they belong to the most recent parts of the central organ, constituting, themselves, a considerable part of the areas which, after P. Flechsig (1920), used to be called "association areas."

Morphokinesis and the "Basal Neocortex"

It has since long been known that, during the ontogeny of the human brain, different parts grow at different rates. Owing to this

[1] The Mankind Quarterly, Vol. XIII, No. 1, July-September 1972, 1972, p. 19.

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"heterochrony"—the term was used by G. R. de Beer[2] in a similar context—*a sequence of shifting* translations occur in all three dimensions with different parts of the brain entering into varying spatial relations to one another. These movements, as far as they concern the cerebral hemisphere proper, the so-called "pallium," were the subject of systematic study by the late H. Spatz, former Director of the Institute of Brain Research in Berlin-Buch, and his school in Giessen and Frankfurt/Main. In a series of papers between 1937 and 1966,[3] *the successive phases* of this sort of "continental drift," summarized under the term "Morphokinese," were worked out in great detail, together with their effects on the final morphology of the brain. The principle of morphokinesis states, in essence, that those parts of the brain that eventually become the most prominent on the surface of the adult brain, are the most "recent" or youngest from the point of view of phylogeny; in ontogenesis, the cortex covering these parts is the latest to develop stratification into the six cell layers which characterize the "isocortex." Correspondingly, the "older" parts are successively dislodged, both in evolution and individual development, away from the surface into the interior of the brain; they are, as it were, "buried" below, and later covered by, the prominent parts. During this process, called "internation" (or retraction and suppression), the "suppressed" parts lose their capacity to make the well-known digitate impressions on the adjacent bone surface; between these impressions digitatae (or gyrorum) the bone surface is raised to form the so-called juga cerebralia, corresponding to the brain sulci. In this way, a characteristic bony relief is formed, a sort of "template" of the adjoining brain surface and its fissuration. A close study of this bony mould, where it is well preserved, makes it possible to draw definite conclusions relating to the extension and complexity of the most recent, that is the most human-type areas of the brain cortex. This applies especially to the convolutions of the frontal and temporal lobes adjacent to the anterior and middle cranial fossae respectively, where the dura mater is comparatively thin. A primordial fissure, called fissura rhinalis or rhinica lateralis, marks the boundary between the "older," mainly olfactory, paleocortex and the neocortex. As we go up in the mammalian stock the fissura rhinalis "migrates" from the lateral to the basal surface of the brain indicating that the neocortex occupies a successively bigger area on the basal aspects of the brain, thus becoming, eventually, what is called the "basal neocortex." It is this part with which we are

[2] G. R. de Beer, *Embryology and Evolution,* Oxford, 1930.

[3] All mentioned in chronological order in W. Kahle's *Die Entwicklung der menschlichen Grosshirnhemisphare*, Berlin, 1966.

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concerned here. In the lower forms, such as the lesser tree-shrew (*Tupaia minor*), the basal neocortex is still a continuous area on the base of the brain, later to be subdivided by the Sylvian fissure into the frontal and temporal divisions.

In fossil man, both divisions are less extensive and less complex with regard to their fissuration, as compared with those of recent man. This important fact can be clearly inferred from the pattern of the corresponding digitations showing up on endocranial casts of fossilized hominid skulls. Such casts have been studied by, among others, Ariens-Kappers (1947), V. Smith-Agreda (1955) and D. Starck (1965). To the best preserved specimens, in this respect, belong some of the skulls of *Homo rhodesiensis* from Broken Hill, Rhodesia, and that of Saldanha, South Africa, a contemporary of the European Neanderthal man who lived during the last interglacial period. The basal neocortex at the time of Rhodesian man was not yet fully developed; both its frontal (orbital) and its temporal divisions were smaller in size and have left less pronounced impressions on the bone of the anterior and middle fossae. As early as 1931 K. B. Schultz was struck by the narrowness of the temporal neocortex in *Homo rhodesiensis*.[4] This is shown in Figure I.

The practical consequences of this kind of brain research applied to the problem under discussion, can be summarized as follows:—

If, as suggested by Gayre of Gayre, in the Negroid brain the powers of expression in the musical and linguistic fields are to be located in the temporal lobes, the structures underlying these abilities cannot form part of the basal neocortex which is, phylogenetically, a recent acquisition of the human species gaining full size and differentiation either *pari passu* or even after the critical transition to the *sapiens* stage; in other words, the cerebral substrata in question must belong to the phylogenetically older parts of the temporal lobes which, according to the principle of morphokinesis, have lost their capacity of "impressing" the underlying bone like the olfactory paleocortex and the whole of the insula (Reili), including the transverse temporal convolutions of Heschl, the auditory receptive centres.

Function of the Basal Neocortex

Though attempts have been made to delineate a specific syndrome of the orbital part of the basal neocortex—H. Heygster (1948), H. Spatz (1966)—it seems more appropriate, at the present stage of our knowledge, to consider the basal neocortex as a functional clinical unit. The pioneering work in this respect has

[4] This does not apply to the brain of the European Neanderthal man (Spatz 1966).

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FIGURE 1

Endocranial casts showing the frontal (Fr) and temporal (T) portions of the basal neocortex in recent man (left) and Rhodesian man (right). In the latter, the neocortex is smaller in extent and more primitive in its relief compared to recent man. After V. Smith-Agreda, 1955. From: Sonderdruck aus "Nachrichten der Giessener Hochschulgesellschaft," 24/1955.—H. Spatz: Die Evolution des Menschenhirns und ihre Bedeutung fur die Sonderstellung des Menschen.

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been made by K. Kleist (1934)[5] and H. Heygster (1948-49)[6] on the basis of a detailed study of war injuries (mainly gun-shot wounds) from the First and Second World Wars.

From a great number of observations two important conclusions may be drawn:—

1. Lesions confined to the frontal lobes over the convexity and the median aspects of the hemispheres have in common a lack of drive or (more rarely) a surplus of drive.

2. This must be differentiated from the syndrome associated with localised lesions of the frontal and/or temporal lobes lying against the anterior and middle cranial fossae, that is the basal neocortex; the distinctive psycho-pathological features here are personality changes, a disintegration of character and striking behavioural abnormalities. The specific human "core" with higher concepts of moral values and social conduct is wiped out (Spatz); intellect and memory are, as a rule, little, if at all, affected.

The following is a case in point. Some years ago I saw this man of 54 in consultation at a mental hospital where he had been sent for observation. He had developed a striking personality change. When charged for receiving and selling stolen goods his relatives, well-off people, were very much upset but he himself "could not care less." His history revealed that many years before, he had been involved in two car accidents and had sustained a depressed fracture in the left temporo-parietal region. There were no apparent neurological sequelae and he had undergone no operation. His memory was unimpaired and there were no epileptic phenomena. Air encephalography showed atrophy due to extensive loss of brain tissue chiefly confined to the basal convolutions of both anterior lobes and the left temporal lobe; these parts of the brain were replaced by a system of intercommunicating cysts. He had full power of reasoning, comprehension and concentration; he was an outspoken extrovert, witty and somewhat garrulous, and completely indifferent with regard to his predicament; he made no effort to exculpate himself from the charge of immoral conduct. The law court found him guilty of criminal behavior but suspended sentence for a period of seven years.

Pick's Dementia and the Association Areas of Flechsig

This brings us to a brief discussion of the correlation between the basal neocortex and certain forms of presenile brain atrophies.

The character of the basal neocortex as a clinical entity is clearly demonstrated in that type of so-called systemic brain

[5] K. Kleist, *Gehirnpathologie*, J. A. Barth, Leipzig, 1934.

[6] From a review of Heygster's papers by H. Spatz in *Der Nervenarzt*, No. 2, February 1962, pp. 89-90.

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atrophies, which has become known as "Pick's Disease" after its first describer in 1892. With rare exceptions, the atrophizing process is confined to Flechsig's association areas in the frontal and temporal lobes, the latest to develop laminar stratification as already mentioned. As a rule, the posterior two-thirds of the superior temporal convolution as well as the auditory gyrus of Heschl, part of the suppressed insula, are spared, neither belonging to the basal neocortex; the fundamental importance of the latter for character, human behavior and social conscience was emphasized by Spatz in 1937[7] and later confirmed by many others. It should be noted that in Pick's presenile dementia, atrophy and cell reduction is most apparent in the three outer cortical layers, sometimes called "supragranular"—obviously referring to those strata lying above the fourth or internal granular layer. This sort of selective damage had struck Critchley in 1933 and was later confirmed by G. Peters (1951) and W. Mayer-Gross (1960). This interesting feature must be mentioned here because F. W. Vint (1932)[8] in his well-known paper on the cell content of the prefrontal cortex stated that, in the East African native, he found the supragranular layer of lesser thickness as compared with measurements made by D. von Economo in European brains.

Gayre, in his paper of 1969 (p. 62), identifies the supragranular with the pyramidal, the third layer and quotes from Vint that this layer contains, in the African native, a greater number of small undifferentiated cells compared with the brain of Europeans.

Unfortunately, the term "prefrontal cortex" is somewhat vague; it indicates the convolutions forming the frontal pole and its immediate neighbourhood. In the time of Vint little was known about the structure and function of the basal cortex.

Vint's findings and conclusions were criticised by P. V. Tobias in his first Raymond Hoffenberg lecture.[9] Tobias concludes from his own "little venture into the study of the brain" (as he calls it) that hypotheses have to be modified "when new facts emerge." Unfortunately, Tobias failed to turn up with new facts. Even his criticism is heavily biased: he simply ignores the work of modern writers in the field such as A. M. Shuey (1958, 1966) and A. R. Jensen (1969). Their work contradicts Tobias' preconceived doctrine of racial equality. Whatever the precise meaning of the supragranular or pyramidal layer may be the fact that the three

[7] *Z. ges Neurol.*, Vol. 158, pp. 208-232.

[8] F. W. Vint, "A Preliminary Note on the Cell Content of the Prefrontal Cortex of the East African Native," *East African Medical Journal*, Vol. IX, No. 2, 1932, pp. 30-55.

[9] *American Journal of Physical Anthropology*, N.S., Vol. 32, No. 1, January 1970, pp. 3-26.

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outer cell layers of the cortex have a definite degree of functional autonomy and differentation is shown in an early paper by F. Nisal, published in 1911. In this paper Nisal describes the effects of experimental isolation (without interfering with blood supply) of the cerebral cortex in newborn rabbits. He concludes that the inner cell layers (i.e. the fifth and sixth layer) at the time of birth are more advanced, and have intimate functional relations with the other parts of the brain than the outer layers which, accordingly, are less affected by experimental isolation.

The remarkable correlation between Pick's atrophy and the association areas of Flechsig is emphasized in *Greenfield's Neuropathology*.[10] However, in the twenties, with O. Foerster's surgical mappings of cortical areas still incomplete, the concept of silent or association areas had a much greater appeal to neurophysiologists and clinicians alike. I may be forgiven, therefore, for relating here an incident which in the context of our discussion has a certain historical flavour.

It was in 1923 when Professor H. Schloffer, then Director of the Surgical University Clinic at the German (Carola-Ferdinandea) University in Prague, was called by the Soviet leaders to the bedside of Vladimir Uljanov Lenin who was suspected of having a brain tumor. It turned out that the spiritual father of the Bolshevik revolution was suffering from a form of dementia, now known as general paralysis of the insane, for short G.P.I. It affects, not infrequently, exactly those parts of the frontal and temporal lobes with which this article is concerned. Lenin died in 1924 and his brain was later sent to the Brain Research Institute in Berlin, the first of its kind on the Continent, whose director, O. Vogt, was entrusted with the histological examination of this unique specimen. It was Vogt's impression that, in Lenin's brain, those cortical layers concerned with what then were held to be "associative" functions, were extraordinarily well developed. From this fact only one conclusion could be drawn: that the possessor of this brain must have been endowed with extraordinary powers of association, being, as it were, a sort of "giant" in this respect. Q.E.D.

Nowadays, Pick's disease is recognized as a well-defined, though rare nosological entity. Since its original description, some 80 cases have been recorded—all in white people (Mayer-Gross, Slater and Roth, 1960).

My own search for a proven case among the South African Bantu was negative. Information, kindly supplied by the leading physicians and neurologists from the three largest mental institutions in South Africa, Sterkfontein, Weskoppies and

[10] *Greenfield's Neuropathology*, 2nd edition, 1963, London, p. 549.

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Baragwanath, and from the Neurosurgical Unit in Johannesburg, revealed that in these places as yet not a single case of Pick's dementia has turned up among the native population, neither on clinical symptomatology, nor on encephalography or post mortem evidence.

I am unable to say if this should be interpreted as a nosological peculiarity of the neocortical parts of the Negroid frontal and temporal lobes. However, I am inclined to think that, in the Bantu, it may be especially difficult to recognize certain behavioural patterns, characteristic of the initial stages of Pick's dementia, as beyond the range of normality. To such patterns must be reckoned lack of spontaneity and "distance," indulgence in stereotype jokes, a degree of garrulousness, the repetitive pattern of the so-called "gramophone symptom" as described by W. Mayer-Gross in 1931, and, above all, loss of abstract attitude and a tendency to interpret phenomena in a more concrete manner (Goldstein and Katz, 1937).

The "Fundamental Dilemma"

In this last paragraph I shall touch upon a more abstract but fundamental problem of evolutionary biology: the correlation between mental faculties and the anatomical organization of the brain. It is implicit in that passage in Gayre's article referring to the *seat* in the brain where the specific Negro abilities in musical and linguistic expression are *located* (my italics).

It should be remembered that, not long ago, psychiatrists of international standing such as O. Bumke (1937) rejected, on principle, the idea that such a correlation exists.

The mechanistic-causal view, implied by the concept of cerebral localization, made its impact on our problem in two alternative ways which, though mutually exclusive, have one thing in common: they are both deterministic.

1. In the neo-Darwinian view, it is the environment or milieu and its selective function, a blind and automatic force (J. Huxley) which shapes the organism by turning its primordial "gene chaos" (G. Heberer) into an orderly aggregate of successively improved gene complexes: the idea of "Darwinian causation." There can be no doubt as to the causal relationship: "The organism is adapted to the environment and not *vice versa*" (G. G. Simpson). In other words, what we have here, is the concept of the tabula rasa or blank-slate organism of the old developmental psychology: adaptation as the result of natural selection and its logical consequence, niche specificity (G. G. Simpson).

2. Alternative to this is the concept of point-to-point correspondence between genetic and behavioural organization upheld by

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the now "classical" behaviourism; it is reminiscent of, but not identical with, Goethe's "Nach dem Gesetz, nach dem du angetreten, musst du deines Daseins Kreise vollenden."

The shortcomings of the strict deterministic concept of cerebral localisation have been obscured for a long time by the doctrine of positivism prevailing in science, and its psychological counterpart, behaviour genetics (G. S. Stent).[11] However, they became clear when it was found that the mechanistic stand required, in the biosphere, the introduction of an *a priori* principle not subject to scientific experimentation: with G. G. Simpson, the founder of modern selective theory, this is the postulate of "sufficiency" which states that natural selection is the only agency capable and sufficient of explaining evolutionary change. With J. Monod[12] it is the "Postulate of Objectivity" which states that no true knowledge that the living organism act projectively, that is, they "realize and pursue a purpose." Monod's postulate leads to a significant consequence; he calls it "the fundamental dilemma" of temporal and causal precedence. It states, hypothetically, that genetic invariance precedes, in time and cause, the teleonomic project by which living beings attain their autonomy or self-determination in their behaviour towards environment. But this implies a reversal of the mechanistic principle and Monod is quite clear about it. According to him, the organism's behaviour is orienting selective pressure, and not *vice versa.*

The idea of "innate" autonomy or self-determination, as Monod calls it, is, in essence, a restatement of a principle, formulated by the German embryologist K. E. von Baer, a contemporary of Darwin; it maintains that the organism has to be already adapted before being able (or in order) to survive. On von Baer's principle, niche specificity is not a necessary result of a blind and automatic "Darwinian causation" but a casual and incidental correspondence—in other words, a contingency.

By reinstating autonomic, that is environment-independent, behaviour as a crucial determinant in evolution the selectionist doctrine has lost much of its orthodoxy, for, what is implied here, is nothing less than a return to the classic, as it were, "pre-Darwinian" principle of linear descent, so clearly formulated and exemplified in the Essay of 1844. Mere geographic proximity, indicating origin from a common parent, affects the characters of a species more profoundly than any efforts of meeting the exigencies of life and surrounding. And conversely, Darwin stresses the dissimilarity of organic beings exposed to very similar conditions but living in areas widely and effectually separated.

[11] *Scientific American,* September 1972, p. 43.

[12] J. Monod, *Chance and Necessity,* New York, 1971.

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What is visualized here is the ability of organic beings to survive in the face of an adverse environment. This brings us back to our specal problem—the brain as the "seat" of behavioural autonomy. We quote from K. Lorenz' essay of 1965: "In an overwhelming number of cases the organism responds to a biologically important outside stimulus without having any previous experience, and without resorting to trial and error; and this response is immediate and follows a specific pattern meaningful in the sense of preserving the species."

The concept of "innateness," clearly formulated in this passage, is outside the range of the causal-mechanistic tenets of both the environmentalists as well as behavioural determinism. It highlights the fact that changes in behaviour acquired by experience, that is learning in the widest sense, can take place only according to a pre-existing program or logical system (as Monod calls it) which is independent of environment. Whatever information the organism receives, or more precisely perceives, is not a random sum-total of unrelated sense data but the end result of a process of selection and integration filtered through successive levels of abstraction (Gunther S. Stent). In terms of evolutionary genetics what is transmitted are not gene complexes but abstract configurations or "structures" reminiscent of, but not identical with, G. G. Jung's "archetypes" and W. Köhler's "Gestalten."

What gains a new meaning here is the eighteenth-century idea of *a priori* knowledge, or knowledge without learning, propounded in Immanuel Kant's *Critique of Pure Reason*, the first edition of which appeared in 1781. It is the pioneering work of the German physiologist E. von Holst (since 1935) which gave the Kantian idea a new impetus and the necessary experimental background. This work rejected the once widespread Pavlovian view that the so-called instinctive movements were the effect of mere chain reflexes, and, even more important, it confirmed that a series of co-ordinated movements, like the wriggling of an eel, which is controlled from a "centre" within the nervous system itself, is completely independent of an outside stimulus; it reflects an environment-independent, "built-in" automatism. Following this line of thought and with much refined experimental methods, S. W. Kuffler and his associates[13] at the Harvard Medical School undertook a detailed study of the complicated process of successive transformations which take place along the path from the retinal receptors up to the visual cortex of the brain.

[13] J. Y. Lettvin and associates, "What the Frog's Eye Tells the Frog's Brain," *Brain Physiology and Psychology*, Key papers, edited by C. R. Evans and A. D. J. Robertson, Butterworth, London and Durban, 1966, p. 94. See also Gunther S. Stent, "Cellular Communication," *Scientific American*, September 1972, p. 43.

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This kind of work, only briefly mentioned here, sheds new light on the problem of cerebral function and localization. It makes the former concept of localized cerebral centres, instrumental in complex behaviour patterns, receptive and expressive, somewhat obsolete and outmoded.

Instead of looking for definite cerebral loci and cortical layers in an attempt to localise innately defined behavioural patterns, it seems more promising to "explain" such patterns in terms of an innate "logical system" which has now begun to reveal its abstract hierarchical structuring.

As we have seen, the abilities of musical and linguistic expression in which the Negro excels cannot be assigned to what we have called the basal neocortex; the latter has a well-defined functional and clinical significance. These abilities will have to be correlated with the "older" areas of the acoustic neocortex, now buried within the insular region, or with those areas which have lost, in the course of humanization, their capacity of "impressing" the adjacent bone of the cranium. Phylogenetically, this means dating them back into the early sapiens or even presapiens stage, and thus making them part and parcel of the specific Negroid genetic make-up.

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